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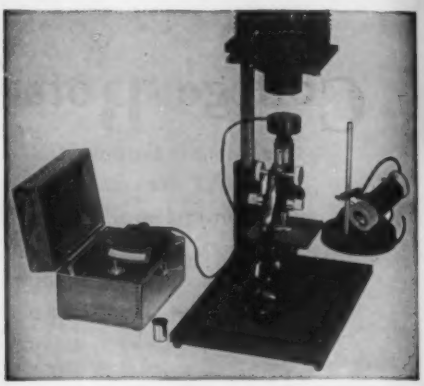

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The present-day society, some 66,000 strong, has come a long way since that day in 1876 when 35 chemists met and gave it its name. Until 1890 it might almost have been called the New York Chemical Society, for that is about what it was in fact. Yet, when it launched the first of its publications, it reached out to every chemist who read the chemical information that the *Journal of the American Chemical Society* contained. The society met only in New York until it was 14 years old, but through the *Journal* its horizon and its influence soon became national in scope.

There is some irony in the fact that, in the Diamond Jubilee year of the society, it is becoming increasingly difficult to draw the line between chemists and scientists or technologists who, nominally at least, belong in other disciplines. Who can say precisely whether a scientist doing a given piece of research is a nuclear physicist or a nuclear chemist? And among chemists who are recognizable as such, there has been such a countertrend in the direction of specialization that a biological chemist and a paint-and-varnish chemist scarcely speak a common language. So we see at the same time a dimming of divisional lines between major disciplines and a sharpening of the boundaries between specialists.

Problems such as these have confronted ACS with a never-ending series of challenges, which it has met with flexibility of organization and constant expansion of its services as new needs have arisen. Today it must have 20 divisions to accommodate all the specializations. There are 138 local sections in 47 states, the District of Columbia, Hawaii, and Puerto Rico. It has accommodated itself to the geographical dispersion of American chemistry and has thereby advanced it.

Equally paradoxical has been the world situation confronting the society. From dependence, American chemistry has progressed to interdependence, combined with a high degree of self-sufficiency. But increasing self-sufficiency has not led to isolation. On the contrary, it is characteristic of the world outlook of the society that, in celebrating its Diamond Jubilee, it also merges itself in the World Chemical Conclave, where international barriers are leveled, as they must be in the world of science.

It would be idle to argue whether the society has shaped the course of chemical development, or whether the course that chemistry has taken has fashioned the society as it is. But it can be said with confidence that the history of ACS, from that prenatal pilgrimage in 1874 to Priestley's grave, where it was conceived, to the World Chemical Conclave of September 1951, where it has matured, gives promise that American chemistry will contribute its full share to a future in which growth is the most certain element.

WALTER J. MURPHY

American Chemical Society
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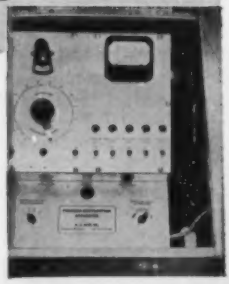

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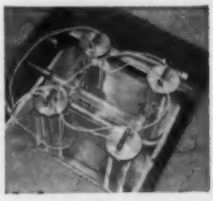

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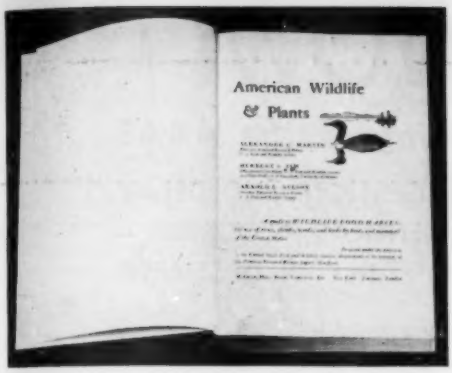

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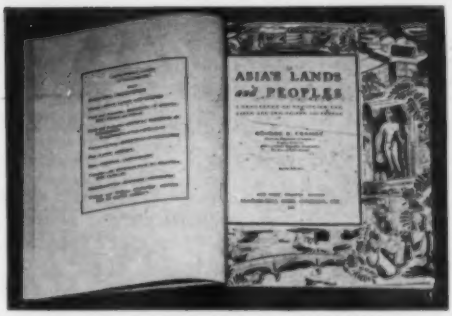

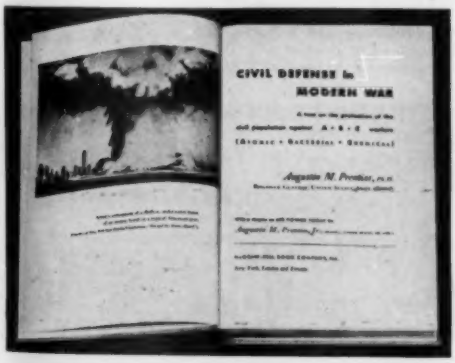

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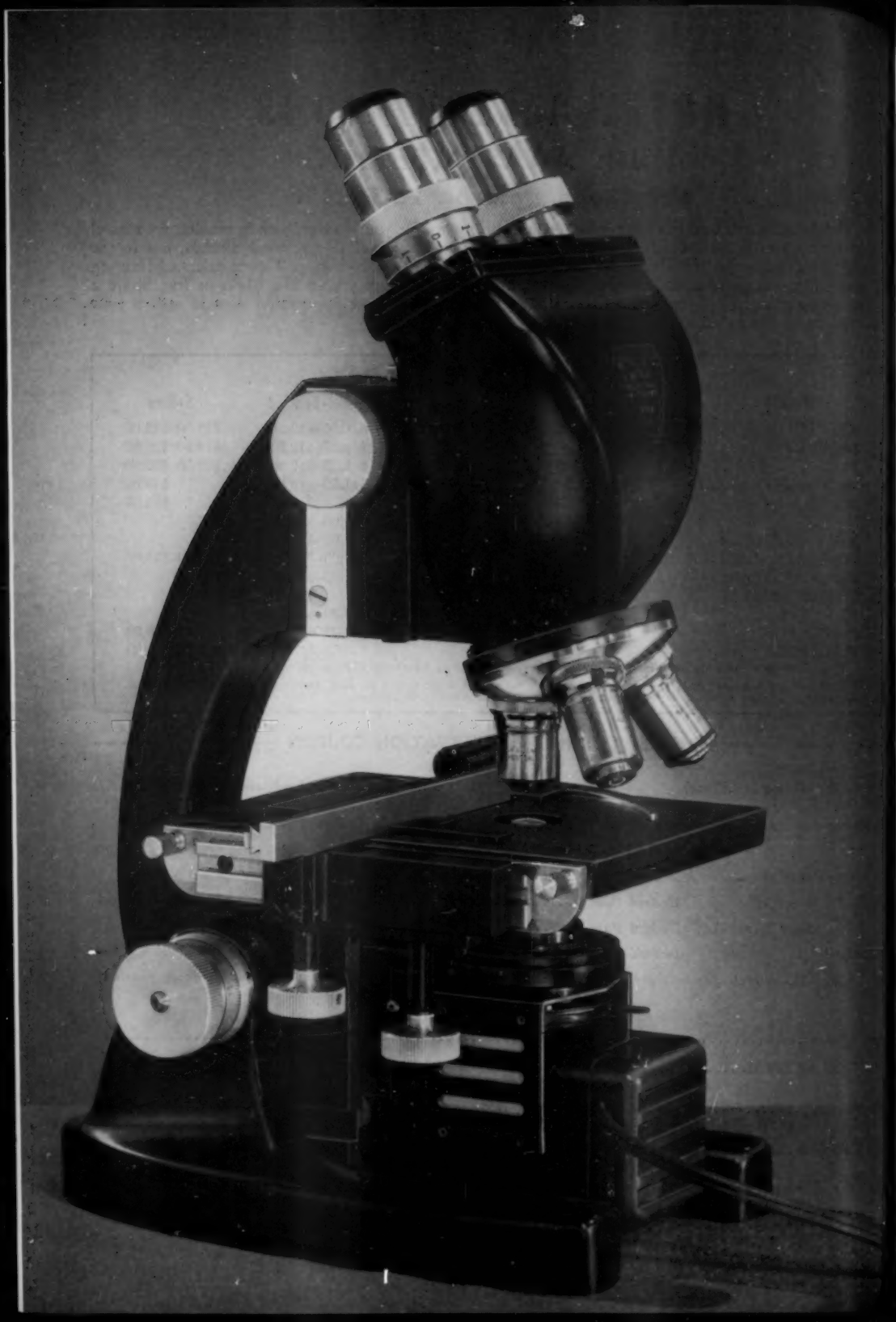

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Contemporary Psychology in the Soviet Union

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THE DRAMA OF THE GENETICS CONTROVERSY, which terminated in the official "victory" of Michurin over Mendel in the Soviet Union in 1948, was re enacted there on a smaller and less dramatic scale during the "Pavlovian sessions" of early summer 1950. At that time it was officially affirmed that there now exist "only two physiologies, pre-Pavlovian and post-Pavlovian," and that the latter is the one prerequisite for a truly "materialist, progressive science" of psychology, physiology, psychiatry, pedagogy, medicine, pharmacology, hygiene, and physical culture (*1, 2*).

The Pavlovian sessions (as the 1950 joint sessions of the USSR Academy of Sciences and the USSR Academy of Medical Sciences are referred to) were held in order to reaffirm and reintroduce *in fact* Pavlovianism into the theory and practice of these disciplines. Undoubtedly, this development must surprise a majority of us, because we have long been led to believe that Pavlovian ideas were fundamental to Soviet theorizing. The truth is otherwise, however. The widespread allegiance to Pavlov, so ostensibly persistent in the literature, has for the most part been merely declarative, and the Pavlovian sessions publicly pointed up what has been for some time apparent to the Russian-reading non-Soviet student.

Soviet psychologists, physiologists, psychiatrists, and others declare, especially in prefaces of books, that the "materialist foundations," which Pavlov "bequeathed to posterity," have always been and still are "basic" to their respective sciences (*3*). But one cannot take such affirmations at face value: not all propaganda is of the strident political sort, and, for the Soviet scientist, statements like the above have a certain "survival" value. Beyond classic Pavlovianism there is very little systematic theory along strictly Pavlovian lines of convincing proportion or degree in either psychology or physiology (*4, 5*).

As a matter of fact, even prior to the Pavlovian sessions, this lack of authentic Pavlovian theory has on occasion been alluded to in the Soviet Union, though obliquely; during these sessions it became the chief item of accusation and self-accusation. Thus, Rubinshteĭn, the only Soviet psychologist to date to have developed a respectable general psychology *on paper*, had to confess to a "grievous sin" (*6*), pointed out by the psychologist Teplov (*7*); to wit, that in his book of 685 closely written pages, *Bases of General Psychology* (*8*), he takes up questions, connected in any way whatever with Pavlovian theory, on only *six!*

Anokhin was similarly embarrassed during the Pavlovian sessions. This physiologist, a leader in his field, dared to have demurred from the widespread practice of seeking only verbal resolutions of difficulties in physiology (*9*); that is to say—if one may be permitted to interpret what Anokhin most likely had in mind—resolutions that are in fact merely exercises in Pavlovian jargonese. Accordingly, Anokhin found himself harshly criticized for almost treacherously turning his back on Pavlov, his mentor and teacher "who had been dead for these many years," and for "attempting to improve on him" (*10*).

Now, it is well known that, contrary to Soviet insistence and claim, Pavlovian theory has proved unacceptable to our contemporary neurophysiologists and, outside the borders of the Soviet Union, excites only historical interest (*11, 12*). According to the Soviet view, however, they are among the "scoundrels" of Western science who assess Pavlovian theory in what we are pleased to call modern perspective.

For example, the fact that Liddell, in his contribution to Fulton's *Physiology of the Nervous System* (*13*), should make only muted reference to Pavlov's achievements and set him a little lower than the gods is taken, not as the neutral estimate of an honest man of science, but as evidence of a "bourgeois plot" to belittle the greatness of one of the Soviet's own (*14*, 11). Sherrington, who opposed the naïveté and crudities of Pavlovian neurophysiology, has, likewise, been made in characteristic fashion the object of a special vilification. Thus, Pavlov and Sherrington personify, respectively, the forces for good and evil in physiology—the one is a "nonmechanistic materialist," the other a "rank idealist;" the former represents "progressive science," the latter "reaction;" and so on and on (*15*).

The present propagandistic glorification of Pavlov has reached incredible proportions. For example, Pavlov is made out as always an upholder of *present-day* Soviet theses. Thus, Pavlov recently became the hero of a motion picture in which he is portrayed, among other things, as a posthumous supporter of Lysenko (*16*)! With an apotheosis of Pavlov akin to Stalin's it is not strange that "deviationist tendencies" from "Pavlovianism" are tantamount to a betrayal of the "people's best hopes" and a sign of "unsoviet servility" to the "reactionary West."

It is not enough that Pavlov, though unsuccessful as a theorist, was an astounding experimentalist and creator of a new methodology. The myth of Pavlov's *all-around* greatness must be maintained at all costs. It *is* being maintained—and at heavy cost, too—as some of the more venturesome scientists in the Soviet Union have been finding out of late.

For years a number of Soviet physiologists have been struggling to free themselves of the Pavlovian

strait jacket while at the same time, to all appearances, circumspectly operating within the Pavlovian terminological framework. These adventurers in physiological theory and experiment achieved some notable successes and attained, in the process, a level of sophistication lacking in earlier work. This, however, has availed them nothing, and during the recent Pavlovian sessions they have retreated, under heavy censure and calumnious attack, to primitive positions prescribed by the representatives of the Party as "truly Pavlovian" (*17, 18*).

Among those who have consistently and assiduously resisted the Pavlovian avalanche, only Beritashvili (Beritov) comes to mind. However, newspaper attacks on Beritashvili have been frequent (*19*), and the inevitable "confession of errors" took place on May 23 of this year at a special meeting called in Tbilisi, ostensibly to discuss the "physiological theory of Academician I. P. Pavlov," but actually to put an end to the intransigence of Beritashvili. Confronted with the charge that his "theoretical views treat the basic processes of psychic activity from the position of idealism and contradict in principle the consistent materialist theory of I. P. Pavlov on higher nervous activity," Beritashvili confessed his guilt and "acknowledged as correct the criticism of his scientific views" (*20*).

Thus, the wheel has gone its full circle. Bekhterev's reflexology, done in by public denouncement at the end of the third decade, now returns as "correct Pavlovian theory." Bekhterev, Pavlov's enemy, now becomes victor in principle, though his name was hardly mentioned during the Pavlovian sessions.

Although Pavlov considered his research on the conditioned reflex as germane to psychology, he, nevertheless, conceived of it as *within* physiology and believed that ultimately the latter might provide the basis for the former (*21*). Bekhterev, on the other hand, had proposed the elimination of psychology altogether as a discipline, because, dealing with the psyche, it was in essence idealistic. In its stead, he formulated a thoroughgoing reflexology (*22, 23*). For attempting this there came a transient triumph and also, after some years, a rather complete renunciation (*24*).

Since the "Trotskyites" of science, when once denounced, stay denounced—this much consistency is demanded amid the shifts of the Party line—the hero of the moment is made to pronounce what had previously been enjoined. That hero is Pavlov, whose own words would strike his ears strangely in the context of present recantation and abject promise to hew to the Pavlovian line in future research. But, ironically enough, the more Pavlovian phraseology is mouthed, the more Bekhterev is affirmed!

Only by verbal formulas is "consciously willing" man saved from "degradation" to a mechanism purely reflexological in operation. These formulas involve essentially "man's unique possession" of a "second signal system," whereby verbal cues take the place of the conditioned physical stimuli constituting the "first signal system." Through the former "signal system" man's behavior, though "based" on physical reflexes, evades a "reduction" to them. "Vulgar mechanism" is thereby avoided, and man kept higher than the animal to whom the "second signal system" cannot apply.

The Pavlovian sessions have been little publicized in the Western world. They are portentous, however, in that in the Soviet Union they are acclaimed as yet another example of not only the "Party's continuing solicitude" for the "proper development" of the sciences, but the Party's announced intention "actively to direct" that development. The writer now proposes to discuss work done in the field of psychology in the Soviet Union and, with the above discussion as background, to indicate how the recent developments have affected this work in its several aspects.

Psychology, as a whole, in the Soviet Union is an uninspiring discipline. It is more a matter of program than of accomplishment. But rather than dwell on its largely negative aspects, it will be more worth one's while to attend to its modest achievements, minor as some of them might be. These are concentrated for the most part in research on conditioning and research on sensation and perception—subjects which we in America classify under psychology or physiological psychology, but which the Soviets regard as coming primarily within the province of physiology, though not always (*25–27*).

As might be expected, a great deal of work has continued in the orthodox Pavlovian vein, but it has not accomplished much except by way of refinement of former studies. Even if one were to disregard or fail to appreciate the internal evidence of the published material, the Pavlovian sessions provide evidence enough of this lack of accomplishment. As a matter of fact, Bykov, who dominated these sessions along with Ivanov-Smolenskiĭ, was voluble in his deprecation of this work (*28*). And it is interesting to note that, for reasons of circumstance, this deprecation falls outside the category of the usual denigration of work and theories to which official hostility has been indicated. Bykov happens to be an out-and-out Pavlovian, and for this reason it is significant that, in his general criticisms, he does not grant too much exception to work done along strictly Pavlovian lines. He avers, and justly so, that basically this work has been an unimaginative rehashing of past experimentation. Bykov emphasizes this, of course, because in the general chorus of *mea culpas* he wishes to give foundation to the charge that even Pavlovians have been remiss in "exploiting the Pavlovian heritage." Thus, he points to the almost complete failure to pursue the Pavlovian theme of the "second signal system," whereby verbal cues substitute for physical stimuli, and laws other than those of the "first signal system" are said to be operative (*29, 30*).

The work of Bykov and his coresearchers, however, must be looked on as a notable exception in this regard. Their area of intensive research has been concentrated largely on the direct conditioning of the

internal receptors and organs, on their relation to the cerebral cortex (*31–33*), and on corticovisceral pathology—that is to say, Pavlovian "psychosomatics" (*34*). Bykov's operating framework is, and has been, strictly Pavlovian. His work, therefore, appears subject to the obvious circumscriptions attendant upon such adherence. Since the writer has had occasion to discuss a number of Bykov's contributions in some detail elsewhere (*35*), further discussion of his interesting school is omitted.

In the field of conditioning, however, the most interesting theoretical and experimental developments have proceeded from the neo-Pavlovian investigations of Anokhin and his co-workers (*36*). For a number of years Anokhin felt that the regularities of reflex behavior discovered by Pavlov and the laws devised by him to cover them were functions of the special techniques employed and gave, therefore, not only an incomplete picture of the conditioned reflex, but also a false one, if one did not recognize the technique-generated quality of the picture.

Anokhin looks on any conditioned response as an integrated complex of motor and glandular reactions, and asserts that it is the experimental situation that determines which of these are made prominent and which subordinate. The Pavlovian laws of conditioned salivary reaction obtain because, under standard Pavlovian experimental conditions, the motor components of the integrated complex are minimally expressed. Change the experimental conditions, and the Pavlovian laws and formulations become inadequate to the situation.

To escape the limitations of the standard Pavlovian technique, Anokhin devised a general method, which he calls the "method of active choice." This provides for precise recording of salivary secretion and free motor movement during and subsequent to training a dog to react variously to two or more spatially distributed goals in the form of reward-boxes (*37*).

Out of these investigations Anokhin has developed a theory of conditioning which in sophistication appears to surpass by far the neurophysiologically unacceptable formulations of Pavlov. In Anokhin's theory the role of reflexes as such is subordinated to that of large-scale functional systems, which not only account for "situational conditioning," but have the dynamic property of modifiability and self-correctability of course of action in conformity to the changing demands of the situation—changes frequently brought on by the very behavior of the animal itself (*38*). In Anokhin's own words, a functional system is "each organization of nervous processes, in which separate and various impulses of the nervous system are united on the basis of a simultaneous and cosubordinated functioning terminated by a useful adaptive effect" (*39*, 32).

Anokhin was severely condemned for his "deviationism" during the Pavlovian sessions. His work is a matter of record, however, and, even though rejected in the Soviet Union as heretical and "Sherringtonian," the results of his theoretical and experimental efforts are likely to be of interest to the American psychologist, if ever they are made available in English.

The work of the renowned physiologist Orbeli and his school appears to be of some importance, and it is regrettable that knowledge of his experimental results and conclusions is limited largely to the Soviet Union, which since the Pavlovian sessions has disowned them as being both "anti- and non-Pavlovian in content and direction." Orbeli devoted much of his research to a study of the role of the sympathetic nervous system in the various processes of the body—research that purports to demonstrate, among other things, the sympathetic innervation of the striped musculature and the influence of the sympathetic nervous system on the central nervous system itself (*40–44*).

Orbeli's supposed preoccupation with the sympathetic nervous system, as a matter of fact, was taken to club him down. He was alleged to have deliberately gone against the Pavlovian thesis of the "dominant role of the cerebral cortex" and to have, therefore, "consistently shunned the undertaking of investigations which would prove its preëminent role in the life and activity of organisms;" in other words, if we understate and moderate the Soviet accusation, he "ignored the cerebral cortex in his investigations" and thus "belittled the wholeness of man" (*45*).

Why investigation of sympathetic nervous structure and function should be regarded as per se a denial of the study of the whole man reflects perhaps that peculiarity of the Soviet official mind which sees non-cerebrally oriented physiological research as constituting an ultimate threat to the contemporary Soviet conception of man as primarily rational, consciously motivated, and free-willing. Why so? Because, for one thing, the psyche is seen as residing in the cerebral cortex, and "psyche" and "cerebral cortex" are made to function as interchangeable symbols in propositional statements. Thus, Ziuzin, for example, speaks of the "influence of the cerebral cortex—psyche—on the cardiac-vascular system . . ." (*46*, 3). Therefore, to do research on the sympathetic nervous system slights the cerebral cortex, hence slights the psyche, hence slights the Soviet's idealized conception of the "new Soviet man"! Thus such research ultimately subverts the Soviet order and must be "corrected."

Orbeli's work is to a considerable degree marked by a devotion to the evolutionary point of view, and the apparent richness of his phylo- and ontogenetic studies seems to bear witness to the value, in his hands, of this approach (*47–49*). Like Anokhin, however, Orbeli has been excoriated for introducing into physiology "false direction, stagnation, and unhealthy subservience to both person and theory"—that is to say, subservience to Orbeli himself and to the program of research initiated and advocated by Orbeli, as director of research. The degradation of Orbeli, which began with Lysenko's successful championing of the so-called "progressive Michurinian biology" in the 1948 sessions of the Lenin All-Union Academy of Agricultural Sciences (*50*), took on ultimate depth when his initial recantation before the Pavlovian

meetings was rejected as "unsatisfactory" because "he did not make a clear criticism and analysis of his admitted errors" (*51, 52*).

On turning to the field of sensation and perception, one encounters considerable work of apparent competence, particularly in the visual area. The emphasis of research has been on "sensory interaction," although other aspects have not gone unheeded.

The major point was established that the secondary or, rather, accessory action of any number of sense modalities can affect the threshold and course of action of a given sense modality. Thus, auditory stimulation as a rule lowers the visual threshold for twilight vision, and a number of other interesting effects have been observed. Kravkov, in particular, and his coresearchers have made a number of solid contributions to the study of sensory interaction, a problem that has occupied the attention of Soviet workers for some years now (*53–57*). Since so little of this contemporary work is available outside the Russian language, it will be interesting to detail some of it in order to indicate both the level of research involved and the experimental results claimed for it.

Any nonvisual stimulation that increases retinal sensitivity to green light has been found to decrease it to red light. The reverse is also true: any nonvisual stimulation which increases retinal sensitivity to red light decreases it for green. From this and other evidence the inference is drawn of the coexistence of two color-apprehending systems with opposed action: one keyed to sensing the red-orange long-wave portion of the spectrum; the other to sensing the green-blue short-wave part—each system also affecting adversely the other upon extraneous modal stimulation (*58, 59*).

The opposite response-character of these two color-apprehending systems is referred to the presumably different reactions of these systems to changes in the state of the autonomic nervous system. Thus, it is found that substances which heighten sympathetic excitability, such as adrenalin and ephedrine, increase retinal sensitivity to light in the green-blue region of the spectrum. On the other hand, substances that heighten parasympathetic excitability, such as pilocarpine, increase sensitivity to light in the orange-red region (*60*).

Furthermore, as already mentioned, these two color-apprehending systems have been discovered to affect each other in a reciprocal fashion: excitation of the green-sensing apparatus depresses the excitability of the red-sensing counterpart, while increasing that of the blue-sensing apparatus. In interactions of this kind the yellow-sensing system is thought of as nonparticipant (*61*).

Insight into these phenomena has been gained by studies of the influence on color vision of direct electric current of weak intensity applied to the eye. Thus, when current is applied to the dark-adapted eye, color vision is affected in an interesting manner. If the anode is applied to the eye, color sensitivity is changed in exactly the same manner as when sympathetic excitatory substances are employed. If, however, the cathode is applied instead, color sensitivity alters in the direction indicated by the action of parasympathetic excitatory substances (*62*).

Theoretically, these phenomena are correlated with differences in the relative concentrations of potassium and calcium ions built up by electrical stimulation. In confirmation, it turns out that direct calcium or potassium ionic application to the eye affects color vision in exactly the same way, respectively, as anodal or cathodal contact (*63*). This, then, is taken to suggest an ionic part-basis for the opposed action of the blue- and red-apprehending systems.

There are many other interesting investigations in sensation and perception that one might allude to outside the field of sensory interaction. For example, it is known that exposure to loud noises raises the auditory threshold. If it is suggested to a subject under hypnosis that all around him there is deafening noise, on awakening it is found, through threshold determinations, that auditory sensitivity has decreased. From this result it is concluded that, along with the conventional peripheral factors, a central factor is involved in auditory threshold alteration (*64*).

To round out the positive side of the picture, one ought certainly to mention the work of Luriya on brain function in its normal, pathological, and restorative aspects (*65–67*), the researches of the comparative psychologists Voĭtonis and Roginskiĭ (*68–70*), and Beritov's studies of "individual behavior by the method of free movement" (*71, 72*). This work is of considerable interest and deserves more than passing allusion. Detailing of this work is a special task in itself, however, and is accordingly postponed for subsequent exposition elsewhere.

With all the allowances that one may make in consideration of the positive contributions that have been here set forth, one must, nevertheless, adjudge the general "situation" in psychology, physiology, psychiatry, and related fields as unsatisfactory. This is an estimate on which one may concur with the Soviets, though for different reasons. In many areas there is "stagnation"—to use the current Soviet term popularized by Stalin in his strictures against the followers of Marr in the field of linguistics (*73, 74*). This has been publicly stated and admitted in detail (*75, 76*).

The solution in part would seem to be to loosen the paralyzing grip of Pavlov. But for the Soviets the solution has been to get *back* to Pavlov. In characteristic Soviet thought-style, stagnation has set in because the followers of Pavlov had strayed from the true path as prescribed by Pavlov (of course, as construed by those who have arrogated to themselves the contemporary right to judge the orthodox from the heretical Pavlovian). Salvation thus lies in embracing a Pavlovian fundamentalism which in effect reinstates reflexology.

This is not the first time in the history of science that a great man has been an impediment to the subsequent development of the very field to which he himself has contributed so much or which he himself has created. It is paradoxical that the "Pavlovian heri-

tage" will be truly exploited only by freedom from its shackling formulations, as experience here in America is demonstrating. But at present it is hopeless to expect an acceptance by the Soviets of this elementary thesis. Reaction and retrogression have taken over here as in some other sciences—all in the name, strangely enough, of progress and the good of humanity (*77*).

Apart from physiological psychology, broadly conceived, what are the real features of contemporary Soviet psychology—not in fine programmatic future perspective, but in fact? There is a great deal of the former recorded; not too much of the latter.

Since the famous 1936 resolution against "pedological distortions" in the Soviet school system (*78–80*), psychology has been relegated in the main to the service of pedagogy, where it has been grubbing out a somewhat pedestrian existence. Its contributions within this area have been neither large in quantity, nor particularly distinguished in quality—some of it being, in fact, quite low. For example, on the basis of an observational study of three gifted children over an extended period of time, Leĭtes, of the Psychological Institute of the RSFSR[1] Academy of Pedagogical Sciences, notes that "talent" is accompanied by a "remarkable inclination for work;" that is to say, a remarkable drive to activity in the exercise of this talent. From this limited observation the conclusion is drawn that it is precisely this "inclination for work" which "generates talent" and, hence, that, "when a teacher arouses interest and love for work, he is directly influencing [children in the direction of] giftedness." In other words, "the secret of the remarkable talent [displayed by gifted children] is their heightened inclination for work." From all of which a *non sequitur* is drawn that borders upon, if it does not reach, the ludicrous:

> And if one should speak of the various [degrees of] cleverness [severally appropriate to] the different social groups, then one is forced to acknowledge, in spite of the test data of foreign scientists, the greater talent of the working classes in comparison with that of the parasitic classes. [And why? Because] workers have one enormous advantage—an inclination to work [!] (*81*, 48).

Teplov, a leading Soviet psychologist and member of the RSFSR Academy of Pedagogical Sciences, from whom more circumspection might be expected, cites and commends these conclusions as demonstrating the Soviet theses of the "unity of work and creativity" and their joint nobility as opposed to the alleged polarization of the two by the "bourgeois psychologists" (*82*). Elsewhere, however, Teplov asserts more moderately that "in the absence of a certain basic core of capabilities a great passionate love for an activity [ordinarily] cannot arise and that, if it did, a man would have always to overcome his weaker sides, to spur on his lagging capacity, and to fight his way to full development of his talent" (*83*, 192–193.)

[1] Russian Soviet Federated Socialist Republic.

On turning to psychological periodic literature, one finds it to consist, for the most part, of articles published in the *Bulletin of the RSFSR Academy of Pedagogical Sciences* (*Izvestiya Akademii Pedagogicheskikh Nauk RSFSR*) and occasionally in *Soviet Pedagogy* (*Sovetskaya Pedagogika*). Articles of general psychological interest are also to be found distributed over a range of publications from the *Teacher's Newspaper* (*Uchitel'skaya Gazeta*) to the journals *Problems of Philosophy* (*Voprosy Filosofii*) and *Bolshevik* (*Bol'shevik*), the latter the authoritative organ of the Communist Party. The quality of psychological publication in these journals is extremely uneven. Thus, in the issue of the *Bulletin of the RSFSR Academy of Pedagogical Sciences* containing Leĭtes's article, there is a paper by Ignat'ev (*84*) on the "psychological analysis of the process of drawing," which would rank high by standards of publication elsewhere.

Some of the articles in the literature make strange reading, being hortatory and, frequently, for seeming want of content, excessively polemical. For example, instead of the psychology of mere man, we read about the psychology of the "new Soviet man." The latter turns out to be an enumeration and armchair discussion of the desirable characteristics that man, reared under Soviet conditions of life, *should* possess (*85*). Instead of a systematic elaboration of theory based on experimental data, we have a tremendous expenditure of energy on refutation and combat of "harmful" theories, "trends," and "tendencies." Nothing is offered by way of replacement or countersuggestion except vaguely spelled-out pronunciamentos and exhortations to do better.

The intrusion of political propaganda into serious scientific literature is decidedly pronounced. To cite a moderate example, Grashchenkov (*86*), writing in the journal *Neuropathology and Psychiatry* (*Nevropatologiya i Psikhiatriya*), concludes his article entitled "For a New Blossoming of Soviet Neuropathology and Psychiatry," with these words:

> The research institutes of our specialty should head the struggle against each and every slanderous distortion of the Pavlovian scientific heritage by foreign neuropathologists and psychiatrists who are fulfilling the will of their Anglo-American imperialist masters, propagandizing idealism as a means of suppressing the self-consciousness of the broad masses of humanity and as an instrument for their stupefaction.
>
> We all have confidence in the victory of progressive materialist Pavlovian physiology, which joins forces with the progressive generalizing dialectical materialist theory of Marx-Engels-Lenin-Stalin.

One may illustrate further the state of affairs obtaining by reference again to the psychologist Rubinshteĭn, who in 1940 turned out quite a respectable general psychology—a real accomplishment for which he received the Stalin prize in 1942. This general psychology was ostensibly based on five general principles: the principle of psychophysical unity; the principle of the developmental unity of the psyche

and organism (both phylo- and ontogenetically); the principle of historicism; the principle of the unity of theory and practice; and the culminating principle, that of the unity of consciousness and activity (*87*). One may in this connection allude also to a sixth principle, which is explicitly recognized everywhere and which may be referred to as the principle of partisanship—communist partisanship, of course.

Rubinshteĭn was subjected to unreasonably harsh criticism in a session called in 1947 to discuss the second edition of his general psychology, which had appeared the previous year. He was given considerable rough treatment because he neglected the psychology of the "new Soviet man," because he did not "correctly resolve the psychophysical problem," because he had a style of writing that was impossible, and so forth. Moreover, Rubinshteĭn's application of the sixth principle was such as not to exclude evidences of a scholarly urbanity in his treatment of foreign psychologies. And because of this, particularly, he was roundly denounced; for lack of partisanship even in the exposition of foreign theories is automatically to make of oneself a "servile fawner" upon them (*88–90*).

The question may now be asked: what has come out of all this? A new book on general psychology by Rubinshteĭn or anyone else? Nothing beyond the elementary level (*91–93*). New theories, worked out systematically and implemented with experimental data? None that the writer has happened upon. The truth is that public accusation and self-accusation, even in the Soviet Union, accomplish no science. Scientific advance is not evoked by the mere exercise of criticism and self-criticism in public sessions, or by the unanimous concurrence of opinion at their termination.

With all the talk in the Soviet Union about the unity of theory and practice, with all the fanfare about psychology's preoccupation with the practical problems of pedagogy and the achievements of the latter as a result, one should expect an array of high-level reported work, at least on those standard problems that present an acute challenge to the sincere teacher. Degree and scope of achievement even here, however, are surprisingly limited. For example, although Russian dialects pose a serious problem to the teacher of standard Muscovite Russian, as of 1947 no general methods or texts had been developed to cope with it in any major dialectical section of the Russian-speaking areas of the Soviet Union (*94*, 102)!

Furthermore, there seems to be entirely too much research devoted to the dry history of pedagogy (*95*) and too little to the brass tacks of teaching, to say nothing of the way the theoretical and psychological foundations of pedagogy, with some exceptions (*96, 97*), are being bypassed. Thus, the *Bulletin of the RSFSR Academy of Pedagogical Sciences* recently could find room to devote 203 of its large-size pages to a history of the teaching methods of "explanatory reading" in vogue from 1850 to 1917, though its issues are limited in number (*98*)!

Although it would be instructive and interesting to elaborate further, this survey has proceeded far enough for one to perceive that the content, state, and condition of psychology in the Soviet Union present a very uneven picture and that, as a science in the Soviet context, psychology has prospered only in those areas ancillary or contiguous to physiology. Whether recent extrapsychological developments constitute a threat to further progress in these limited areas cannot, of course, be answered, although on this score one may justly entertain some uneasiness.

It is also evident that the political and ideological strait-jacketing of psychology has been both restrictive and deleterious in its effect on this science. Since 1936 it has been largely kept to routine pedagogical investigations. It thus lacks generalized scope. A psychology that in practice excludes, for example, psychotherapy as a subject of study is assuredly one that denies itself a sufficient generality, particularly when there is no psychotherapy to speak of as a specialized subdivision of scientific endeavor in the Soviet Union.[2] And when one learns further that, of all things, there is practically no industrial or social psychology[3] worthy of the name, nor is any encouraged, one may be allowed to come to the restrained conclusion, particularly in view of the total evidence, that the circumscriptions that beset psychology in the Soviet Union are severe and narrow enough to throttle both its originality and healthy growth.

In view of the tendency to emotionalized generalization in these difficult and intemperate times, the writer wishes, before concluding, to allude to the need for caution in passing judgment on the Soviet scientific scene as a whole. Although much that he has remarked about the science of psychology bears on the situation in other sciences and reflects more or less similar features of control, retardation, and even retrogression, to generalize would be misleading. Certain areas of mathematical research, for instance, rival output in the best centers elsewhere (*102*), and almost the same might be said of some branches of the physical sciences (*103*). There are, to be sure, signs of growing interference even here, but the more necessarily esoteric the vocabulary of a science and the more remote its theory from the direct comprehension of every-day practitioners, the better its chances for an autonomy of sorts. The picture is by no means all black, and it would be folly to exaggerate for total effect a situation that is bad enough.

Psychology in the Soviet Union has had its radical

[2] Wortis, the author of a recent book on Soviet psychiatry (*99*), makes mention of the lack of any "formalized" psychotherapy. Wortis, however, ascribes its absence to the inherent on-going therapeutic aspects of Soviet society—hence, no need for psychotherapy as such. This is an uncritical attenuation of the brasher Soviet claim that, since the neurosis-breeding "contradictions of capitalist society" do not exist in the Soviet Union, they are not reflected there and that "bourgeois" psychotherapeutic measures are, therefore, both inappropriate to the scene and unneeded in general (*100*).

[3] Industrial psychology is equated to "psychotechnic," which was denounced, along with pedology, as being a "vicious, bourgeois importation." For discussion on pedology, see *101*.

shifts before at the behest of Party interlopers (*104*). Yet, however unlikely in the immediate future, one cannot discount the possibility of another change—this time more in the direction of what we, perhaps presumptuously, would like to call the better. But, until such time, Soviet psychology, strait-jacketed and dogma-bound, will probably continue to be the discipline of little significance that it is now.

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Technical Papers

Eocene Volcanism in Central Utah[1]

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Work during the past three field seasons in Long Ridge, central Utah, has disclosed several important stratigraphic relations in the regional geology of the area. They are presented briefly here in anticipation of a forthcoming longer paper so that they may be immediately available to other workers. Long Ridge is located about 10 miles east of the Tintic mining district and extends southward about 30 miles; the area specifically under consideration is at the southern tip of Long Ridge, about 7 miles southwest of Levan, Utah.

At this locality about 870 ft of thin-bedded Green River limestone and shale crops out in unbroken succession. In the upper 200 ft of the formation bentonitic tuffs are intercalated with the limestones, some of which contain much biotite. Conformably above this sequence is the Golden's Ranch formation, a series of tuffs, bentonites, and volcanic boulder conglomerates. This sequence can be seen along the new roadcuts of U. S. Highway 91 southwest of Levan.

Six miles to the northwest the same section is again found, except that the lower part of the Green River is covered. In addition, 820 ft above the base of the Golden's Ranch formation, a relatively pure limestone with abundant plant remains crops out. The plants in the limestone, which is here named the Sage Valley limestone member of the Golden's Ranch formation, have been determined as upper middle Eocene or lower upper Eocene by Roland W. Brown. A comparison of thin sections of boulders from the volcanic conglomerates *below* the Sage Valley limestone with those prepared from flows in the latite series of the Tintic area shows that the boulders are from the flow areas. Hence, the flows are clearly somewhat older than the boulders derived from them and are therefore middle or lower upper Eocene in age. Further, field tracing of the volcanic conglomerates in the Golden's Ranch brings to light the fact that they grade laterally into volcanic breccias that are an intimate part of the latite series in the northern part of the area and in the Tintic district (*1*).

The history of the area, during at least a part of the Eocene, as determined from the above observations, is briefly as follows: While calcareous and argillaceous sediments of the upper Green River were being normally deposited in a shallow lake, volcanic eruptions began in the Tintic area to the west. Flows and breccias were deposited on relatively steep slopes (*2*) while airborne volcanic products were being interbedded with the Green River sediments in the lake. Continued volcanism and the work of streams on the volcanic products resulted in the deposition of coarse volcanic conglomerates and tuffs and the cessation of lacustrine limestone deposition. At some time after the initiation of volcanism a new water body of probable local extent and irregular outline existed; in it was laid down the Sage Valley limestone. Above it were deposited more volcanic conglomerates and tuffs. Their age cannot yet be accurately determined.

The occurrence of plant fossils, associated with volcanics, together with the gradational relations between the well-dated Green River formation and the Golden's Ranch formation, and between the latter and the latite series, presents the first specific dating of the widespread volcanism of central Utah. Previously, this had generally been considered to be much younger (*1, 3*).

[1] The author gratefully acknowledges the financial support of the Atomic Energy Commission and of The Ohio State University.

[2] Atomic Energy Commission predoctoral fellow, 1950–51. Present address: U. S. Geological Survey, Fredericktown, Mo.

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Inadequate Stimulation of Olfaction

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Several workers in the field of olfaction have reported difficulties in obtaining test spaces for research purposes with an absolute zero level of odor. Such spaces are needed in olfactory research to serve as control rooms for comparison with test rooms of low odor levels, to act as reservoirs for the introduction of odors near threshold concentrations, and for the operation of odor test panels.

The use of activated carbon as an air-cleaning device to remove all sources of olfactory stimulation from a test space can be successfully carried out provided certain precautions, as described here, are taken. In the absence of such measures, a test space in which air has been purified by activated carbon sorbents may give rise to an odor variously described as "yeastlike" or "alcoholic," which, though not unpleasant and often even unnoticed by a lay observer, interferes with an olfactory research program (*1*). The theoretical implications of this phenomenon are of great interest. We have found that the olfactory stimulation in such cases is related to an inert aerosol, and hence is an "inadequate" stimulation of olfaction in the sense that no gas or vapor is invloved.

Experimental generation of the odor. Fig. 1 shows an arrangement of apparatus suitable for a reliable olfactory detection of the aerosol in question. *A* is a

ball rotameter covering the range of 10–100 liters/min of air flow (Fischer & Porter Co., Hatboro, Pa.), and *B* is a 6- to 14-mesh granulation of an appropriate sorbent. Compressed air (usually foul in odor) is passed through the following in series: a glass wool filter, a 4-in. layer of anhydrous calcium chloride, a 4-in. layer of granular silica gel, and an appropriate humidifier, if desired. The air is then introduced into the rotameter *A*. An aerosol stimulation is then detectable in the exit gas when the granular material *B* is any grade of activated carbon, whether of gas or liquid adsorption type of pore structure.

Detection is facilitated when the nose is placed so that the exit gas from *B* is directed toward the nostrils. Some sophistication in odor detection on the part of the observer is necessary, but once this is acquired, the ability to identify the stimulus, with or without blindfold, never fails. Six subjects have been used in the tests in this laboratory. Foster (*1*) has similarly reported unequivocal detection of this stimulus.

Because the "yeasty" quality of the stimulus may suggest a microorganic origin, the following experiment was carried out. Activated carbon was transferred directly from the furnace in which it was manufactured, while glowing cherry-red, into a steam-cleaned Pyrex flask, then sealed with a ground-glass stopper and brought to the laboratory for test. The aerosol stimulation as described above was unchanged. This eliminates the possibility of microorganic origin.

The same quality of olfactory stimulation was obtained when various other black sorbents were substituted for carbon in *B*. These sorbents included (*a*) silver on silica gel, prepared by adding aqueous silver nitrate to silica gel in a hydrogen atmosphere, then drying the product; (*b*) cobalt oxide-nickel oxide, Co_2O_3—NiO, on activated alumina, prepared by impregnating the alumina surface with an aqueous solution of the nitrates, drying at low temperatures, and then decomposing the nitrates. Colored adsorbents substituted for the carbon in *B* gave olfactory stimuli of varying intensities and perhaps qualities. These sorbents included the following: *white*—activated alumina; *green*—chromium oxide, Cr_2O_3, on activated alumina, prepared by decomposing ammonium dichromate on the alumina surface; *blue*—cobalt aluminate, Thenard's blue, $Co(AlO_2)_2$, prepared by low-temperature wet decomposition of cobalt nitrate on alumina; *reddish-brown*—iron oxide, Fe_2O_3, on activated alumina, by decomposition of precipitated ferric hydroxide on the alumina. Untreated silica gel (colorless) does not produce the stimulus.

Examination of carbon for foreign vapors. A 300-ml (150-g) sample of carbon was heated to 100° C and evacuated at high vacuum, using a mercury diffusion pump, through 3 collecting traps cooled in ice, dry ice, and liquid air (*2*). Pumping was continued for 1 hr. The traps were then closed off, and the contents of each admitted to the sample system of a mass spectrometer. After atmospheric and background peaks were accounted for, the result was a complete blank. Since the volume of the traps was 50 cc, the leak pressure 1.2 cm, and the sensitivity of the instrument 12.5 scale divisions/mm of gas pressure, and assuming, conservatively, a minimum detectability of 1 scale division and a gas of mass 50, the maximum possible quantity of undetected impurities is 1.3×10^{-5} g. On the basis of a 150-g sample of carbon, the maximum amount of undetected impurities would be less than 9 millionths of 1%. The sample of carbon thus subjected to high vacuum degassing, when returned to the odor test apparatus, gives the same aerosol stimulation.

Aerosol filtration. The passage of the effluent air from the sorbent *B* (Fig. 1) through a suitable dry fibrous filter produces air at a zero level of stimulation. The filter recommended is that described by W. J. Smith and E. Stafford, of Arthur D. Little, Inc. (*3*), and should be used with a linear air flow of 5 ft/min through the filter bed. For suitable treatment of air for odor research purposes, a system combining cells or canisters containing efficient gas adsorption activated carbon (*4*) with the dry fibrous filter described by Smith and Stafford is therefore recommended.

The evidence disclosed indicates that inert aerosols can provide some olfactory stimulation. An attempt was made to examine the aerosol particles by passing the effluent air from *B* (Fig. 1) through a thermal

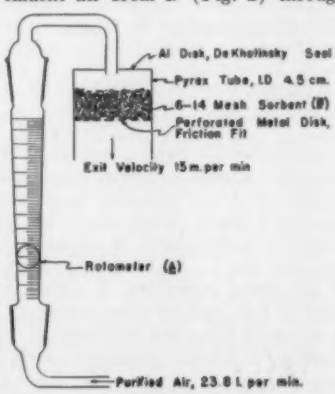

FIG. 1.

precipitator, using a cold plate coated with Formvar and by examining the collected matter with an electron microscope. Some particles in the size range around 5 μ were collected. No systematic study was undertaken, however, to relate the production of particles to the production of odors.

The experimental facts presented in this paper are consistent with the infrared absorption theory of odor of Beck and Miles (*5*) and would be interpreted by this theory as scattering or absorption of the infrared radiation by particles of different sizes, colors, and shapes in contact with the sense cells (*6*). Color variations would be indicative of variation of infrared absorption in the 7.5–15 μ region of postulated sensitivity. Particle shape would influence the maximum

of absorption. Size would influence both the amount absorbed and the scattering coefficient, which is maximal for 10 μ radiation when particles are in the size range of 5–15 μ. The evidence, however, is not to be taken as a proof of this theory.

The production of sorbent aerosols may well be related to thermal chipping caused by local temperature rises on the adsorbent surface caused by heats of adsorption of atmospheric moisture and possibly other normal atmospheric gases. A rise in the humidity of the air entering the sorbent, accompanied by increased adsorption of moisture, generally causes some increase in the intensity of the olfactory stimulus.

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A Simple Method of Mounting Gross Biologic Material in Plastic Boxes[1]

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A simple, quick, and inexpensive method of mounting gross biologic material in acrylic plastic[2] should be of wide interest. Gross slices of tissue fixed in formalin or other suitable preservatives are permanently mounted in nonbreakable, transparent boxes. Approximately 20 min is required to prepare each section, and no special equipment is needed. Specimens mounted in this manner three years ago have shown little change in color and no leakage.

A wide variety of biologic materials usually preserved in glass jars may be preserved by this method. Gross brain sections in plastic boxes are of great value in the teaching of neuroanatomy and neuropathology. Many other normal and pathologic human and animal tissues may be similarly mounted. Since the specimens are in nonbreakable containers, they may be handled freely and may be shipped anywhere. Material prepared in this way requires very little space for display in a museum. Indeed, a small museum may be contained in a standard filing cabinet ready for display any time.

The materials and method used in the mounting of gross brain material are presented as an example of one of the uses of this simple method.

[1] Specimens preserved by this method were presented as an exhibit at the meeting of the American Academy of Neurology, Virginia Beach, Va., April 11–13, 1951.

[2] Plexiglas (Rohm & Haas) and Lucite (Du Pont) have both been used.

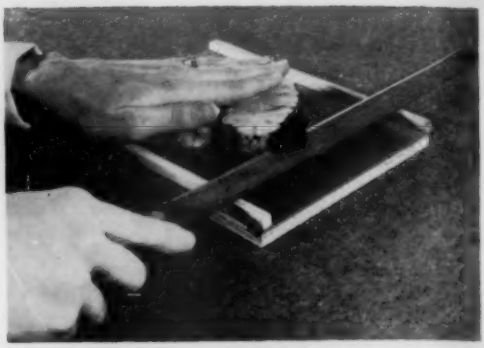

FIG. 1. Specimen being sectioned on a simple cutting board.

FIG. 2. Specimen is sealed in plastic box.

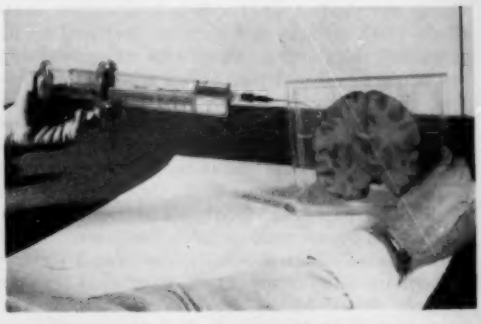

FIG. 3. Filling plastic box with formalin solution.

Transparent plastic boxes with fitted lids were ordered from a local manufacturer of plastic products according to the following specifications for each box:

A. A 1/8" rectangular plastic sheet for the bottom of the box cut in one of the following sizes: 7" × 5¾", 6¼" × 5½", or other size as needed. End pieces ¼" thick and ¼" high sealed to all four margins of the bottom sheet. A hole 1/16" in diameter bored in one of the end pieces.

B. A lid of 1/8" thickness in size identical with the bottom of the box.

Ethylene dichloride, technical grade, was used as a solvent to seal the lids on the boxes.

A viscid plastic-ethylene dichloride mixture was made by placing approximately 10 cc of scrap plastic in an airtight bottle and adding approximately 40 ml of ethylene dichloride. The plastic dissolved in about 24 hr.

Preparation of specimen is shown in (Fig. 1). Brains fixed in 10% formalin solution for 2 weeks were sectioned on the cutting board (masonite bottom; ¼" guides). With firm pressure on the tissue, sections were actually cut very slightly thicker than the ¼" guides on the board.

The plastic box (Fig. 2), was washed with detergent dissolved in water and blotted dry with Kleenex. The brain specimen was then centered in a box of suitable size. The top was sealed to the box with ethylene dichloride applied with a brush. Bull Dog Clips, used to exert pressure, were allowed to remain in place for 10 min.

A 50-ml syringe was filled with a 5% formalin solution, which was slowly injected into the box through the 1/16" hole (Fig. 3). The hole was then sealed with plastic-ethylene dichloride mixture.

The Thromboplastic Activity of Hyaluronate[1]

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Studies of experimental and human arteriosclerosis have drawn attention to the ground substance, or interfibrillar cement, which is an important constituent of blood vessel structure. Such substances are conspicuous in arteriosclerosis and appear to be involved in its pathogenesis (*1*). This led to a detailed study of the mucoid substances in normal and sclerotic blood vessels. In a few instances it was noted that coronary artery thromboses had developed in close relationship to the exposed mucoid materials of sclerotic intimal plaques. This observation led to a study of the possible role of such substances in the mechanism of coagulation.

The sulfate-free acid mucopolysaccharides are viscous substances of high molecular weight and would appear to be ideally situated as agents concerned with the initiation of blood coagulation (*2, 3*). A mucopolysaccharide, hyaluronic acid, is richly present in the subepithelial vascular reticular tissue of the skin and mucous membranes. Many, if not all, capillaries are supported in a mucoid ground substance that is presumably hyaluronate. A similar mucoid material is present in the intima and media of arteries and veins. The exact chemical constitution of the mucoid ground substance in normal or sclerotic blood vessels is not known. We have found, however, that much of this material can be removed with testicular hyaluronidase (*3*).

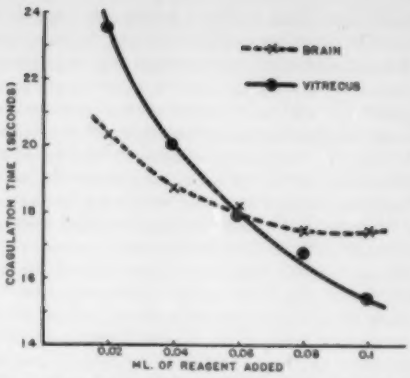

FIG. 1. Comparison of coagulation time of recalcified plasma by human brain thromboplastin and by hyaluronate.

To study the possible thromboplastic role of this mucopolysaccharide, we have used bovine vitreous humor as our source of material. The vitreous humor contains a viscous solution of hyaluronic acid, a minute quantity of an insoluble collagenlike protein ("vitrein"), soluble proteins, and small molecular substances derived from the blood plasma. The "hyaluronate" used in these experiments was the native substance of the vitreous humor removed from frozen beef eyes. After thawing at room temperature, it was centrifuged at low speed for 10 min. That portion too viscous to pipette was removed with a pair of forceps, and the remaining supernatant was utilized as a thromboplastic reagent. Further purification by the method of Meyer (*4*) or of Alburn and Williams (*5*) resulted in depolymerization and loss of thromboplastic activity. The few commercial preparations of hyaluronic acid that we have tested have not been thromboplastic. Three observations, however, cause us to attribute the thromboplastic activity of vitreous humor to the mucopolysaccharide itself: (1) The activity is not affected by centrifugation at 16,000 rpm for 2 hr, as in the method used for separating tissue thromboplastins; (2) the activity is destroyed by incubation with hyaluronidase; (3) known types of thromboplastin are not affected by hyaluronidase. It remains to be proved whether a combination of hyaluronate with native proteins is essential for thromboplastic activity.

The coagulation time of whole blood, measured by a modification of the Lee and White method at 37° C, was shortened from a control time of 12 min 40 sec to 2 min 50 sec by the addition of 0.1 ml hyaluronate, diluted with 0.9 ml water, to 1 ml fresh whole blood. This was a greater decrease than that produced by the addition of an amount of purified beef lung thrombo-

[1] This investigation was supported (in part) by research grants from the National Heart Institute of the National Institutes of Health, USPHS, and from the American Foundation for High Blood Pressure.

[2] We are indebted to Walter Seegers, of Wayne University School of Medicine, for supplying the purified prothrombin and accelerator globulin utilized in this study.

plastin equivalent to the hyaluronate activity when tested in the more purified system described below.

The activity of the hyaluronate was then compared with that of the human brain reagent as prepared by Aggeler (*6*) and used in the routine performance of the one-stage plasma prothrombin determination. In the dilution experiments illustrated in Fig. 1, a constant volume of 0.1 ml fresh plasma and 0.1 ml 0.025 *M* calcium chloride was used with varying amounts of the thromboplastin and hyaluronate, then assayed by the Quick method. The results show a greater thromboplastic activity with increasing concentrations of hyaluronate than of brain thromboplastin. Aged plasma gave slower clotting times, which could be restored to normal in the case of both thromboplastic substances by the addition of purified accelerator globulin.

For a more quantitative analysis of the thromboplastic activity of hyaluronate, we turned to the two-stage analysis described by Ware and Seegers (*7*), modified by carrying out the determinations in silicone-lined glassware at 37° C in the absence of acacia. The incubation mixture contained: (*a*) sufficient purified prothrombin to yield a maximum of 2.6 units of thrombin; (*b*) 2.5 γ/ml of purified accelerator globulin; (*c*) imidazole buffer (final pH, 7.28); and (*d*) Ca in a final concentration of 0.0112 *M*. The second stage was carried out at 37° C with 0.24% fibrinogen (Armour) in 0.9% saline. One unit of thrombin was defined as that amount which produced a clotting time of 15 sec, and was equivalent to 0.004 mg/ml thrombin (Topical, Parke, Davis & Co.). All reagents were of bovine origin.

In order to establish the fact that the thromboplastic activity of the hyaluronate was not due to contamination by tissue thromboplastin, both the vitreous humor reagent and beef lung extracts, prepared by the method of Chargaff (*8*), were preincubated with 15 mg hyaluronidase (Armour's crystalline, testicular material). As shown in Table 1, there was a marked and progressive loss of activity in the case of the hyaluronate, and no significant change in the activity of the lung extract.

The next point of interest was to determine whether calcium ions and accelerator globulin played the same

TABLE 1

EFFECT OF HYALURONIDASE ON THROMBOPLASTIC ACTIVITY OF VITREOUS HUMOR AND BEEF LUNG THROMBOPLASTIN

Time of incubation	Units of thrombin formed in first 5 min			
	Vitreous humor		Beef lung thromboplastin	
	Without hyaluronidase	With hyaluronidase	Without hyaluronidase	With hyaluronidase
1.5 hr	0.35	0.08	0.75	0.50
2.5 "	0.18	None	0.70	0.65

TABLE 2

INFLUENCE OF CALCIUM AND ACCELERATOR GLOBULIN UPON THE CONVERSION OF PROTHROMBIN TO THROMBIN BY HYALURONATE

Time of incubation	Units of thrombin formed			
	Prothrombin + hyaluronate	Prothrombin + hyaluronate + Aeglobulin	Prothrombin + hyaluronate + calcium	Prothrombin + hyaluronate + Aeglobulin + calcium
15 min	0	0	0.18	0.65
30 "	0	0	0.20	0.65

accessory roles with hyaluronate as with tissue thromboplastin. The particular demonstration illustrated in Table 2 shows that calcium is essential for hyaluronate activity, and that the rate of prothrombin conversion is considerably increased by the presence of the accelerator factor.

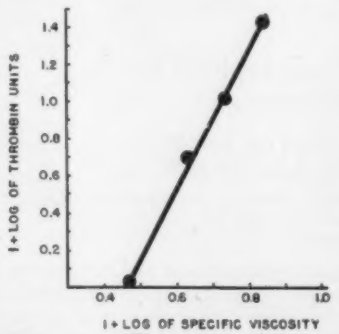

FIG. 2. Relation of log of hyaluronate viscosity to the log of thrombin yield in 5 min at 38° C. Specific viscosity = $\frac{\text{flow time (hyaluronate)}}{\text{flow time (water)}} - 1$.

From simple dilution experiments, it became obvious that the thromboplastic activity of hyaluronate was proportional to some function related to viscosity. This was studied quantitatively with the aid of a 5-ml Ostwald viscometer at a temperature of 38° C. The viscosity of various dilutions of the vitreous humor reagent was compared with that of water. Each dilution was then added to the purified system described above, and the amount of thrombin formed in the first 5 min was recorded. The log of the rate of thrombin formation was found to be directly proportional to the log of the specific viscosity, as illustrated in Fig. 2. A similar relationship between the log of plasma clotting time and the log of thromboplastin concentration has been described by Astrup (*9*).

In working with plasma, hyaluronate of fairly high viscosity must be used to demonstrate thromboplastic activity, although it is still diluted considerably more than any hyaluronate encountered in tissues. Since the

thromboplastic activity is related to the degree of polymerization of the hyaluronate, which is readily altered, resulting in loss of viscosity, the activity of low-viscosity preparations is best demonstrated in the two-stage purified system. The addition of 1% sodium chloride, a slight change of pH in either direction, successive freezing and thawing, or even standing for any length of time at room temperature are among the factors that cause both a loss in viscosity and in thromboplastic activity.

Thus it can be seen that sulfate-free hyaluronate, as it occurs naturally in the body, perhaps in combination with a protein, is an active thromboplastic agent. Its activity in coagulating blood is related to its viscosity. Like thromboplastin of tissue origin, it is dependent upon calcium, is affected by accelerator globulin, and has similar kinetics. Unlike tissue extracts, however, its activity is destroyed by hyaluronidase or by any physical procedure resulting in depolymerization. It is noteworthy that the simple sulfonation of hyaluronic acid produces a strong heparinlike anticoagulant (*10*). The widespread distribution of hyaluronic acid in tissues, and the accumulation of it or a similar substance in areas of arteriosclerosis, suggest that it may play an important role in the coagulation of blood *in vivo*.

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Tobacco Mosaic Virus Mutation

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All plant viruses that have been sufficiently studied reveal the existence of one or more strains which have evidently arisen by mutation. This subject has been frequently reviewed, most recently by Bawden (*1*). The number of strains reported for a single virus is often large, but the frequency of virus mutations has not been clearly established.

Much of the claim for high rates of virus mutation rests on the earlier studies of the yellow tobacco mosaic virus. McKinney (*2*) concluded from a study of more than 5,000 plants that the occasional yellow spots resulted not from viruses introduced from the outside, but from strains that originated as mutants in the tissues involved in the spots. Kunkel (*3*) reported that 232 plants, inoculated with 4 green strains, yielded over 5,000 yellow spots, or an average of about 6.6 spots/plant, and 0.5–3.0 spots/leaf. Jensen (*4*) and others have come to similar conclusions. Hence, the common occurrence of yellow spots on otherwise green mosaic plants has been attributed to mutations of the green virus, rather than to yellow strain contaminants in the green types.

Efforts have been made in this laboratory to determine the number of strains of the tobacco mosaic virus that are definitely determinable as such, by the available techniques. The number of these strains is found to be relatively low (*5*). If the numerous yellow variants reported to occur should be considered as mutations they would necessarily seem to be identical or recurring mutations.

To secure further information on this matter it would appear to be necessary to eliminate all possibility of contamination of green strains with yellow strains. This has been possible with improved technique as far as differentiation between green and yellow strains is concerned. The local-lesion technique in serial transfers was used to eliminate the yellow strain contamination. When green strains yield only green isolates they may yet only be assumed to be free of yellow, since more than one strain may exist in a green strain obtained from a single lesion.

Nicotiana sylvestris is well known as a test plant for yellow strains, but it unfortunately also gives local lesions with some green strains (*6*). Nevertheless, if local lesions are not obtained on *N. sylvestris* from green isolates, it appears to be satisfactory evidence that a yellow strain is not present in a totally green plant. However, local lesions on *N. sylvestris* must be verified by yellow symptoms on Havana Seed test plants to establish that a yellow strain is present if prior symptoms do not confirm this point. Tests on *N. sylvestris* often reveal the probable presence of a yellow strain long before yellow symptoms have appeared. In some instances where a single yellow spot has developed on an otherwise green mosaic plant the presence of a yellow strain has been demonstrated in areas considerably distant from the tissue involved in the spot. At least 8 strains of green mosaic have been secured that are free of yellow contamination. Many of these plants have been grown in the greenhouse, under optimum conditions for yellow strains to develop, for a period of 3 months, and to the 15–20 leaf stage without the appearance of any yellow mutations.

The reasons for easy misinterpretation of results with yellow spots are due to several circumstances, such as interference phenomena and environmental conditions. Altogether, these factors may yield an infinite variety of symptoms within fairly restricted boundaries, beyond which, however, further variation is not to be expected.

Our experimental results appear to have established the following: (1) Green and yellow strains may be readily separated where they exist in mixtures. (2) Green strains, if completely free of yellow strains, were not found to yield yellow spots. (3) Yellow areas very similar to those reported as "mutations" may be

"synthesized" by proper mixtures of known yellow and green strains under controlled environmental conditions. (4) The known yellow strains, of which only 5 have been encountered in our studies, show that new isolates are similar to older known strains. (5) No evidence was secured that some strains mutate and others do not.

The conclusion has been reached that the yellow spots occurring only occasionally, or frequently, in green tobacco mosaic strains are usually the result of contamination with yellow strains. A more detailed account of the results is planned for a later paper.

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The Formation of Cycloparaffins in Petroleums

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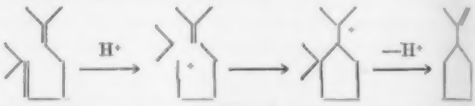
The formation of cycloparaffins, found so abundantly in petroleums, has never been plausibly explained. In a previous paper (*1*) evidence was presented that the chemical reactions resulting in petroleums involved typical carbonium reactions caused by acid silicate catalysts in the form of natural clays, and possibly other minerals, in contact with the heavy oil undergoing change. Some of the evidence was more fully given in two previous papers (*2*).

In the first paper referred to (*1*), it was pointed out that carbonium ions offer the only plausible explanation for the formation of aromatic hydrocarbons, always present and sometimes in substantial proportions in petroleums, within the low temperature limits which the chemical evidence, and particularly the geological and field evidence, impose. The same type of carbonium ion reactions explain the large number of paraffin hydrocarbons of normal and branched chain structure found in straight-run gasolines. Neither paraffins nor aromatic hydrocarbons are found in the heavy bitumens or heavy asphaltic oils containing no gasoline, which D. C. Barton (*3*), on geological evidence, regarded as the intermediate material between typical petroleums containing gasoline and the original organic source material. In a very recent study of the Wilcox, Sparta, and Cockfield formations of the Louisiana Gulf Coast area, Bornhauser (*4*) concluded that "the fact that the light oils are found in the shale facies or in the transition zone to the sand facies appears to lend considerable support" to the theory of catalytic action.

It is just as important, however, to explain not only the formation of the paraffins and aromatics, but the cycloparaffins as well. It has been previously pointed out (*5*) that the cycloparaffins, including many cyclopentanes and cyclohexanes, found in substantial proportions in petroleum, cannot be accounted for by the degradation of any known possible source material, nor by the hydrogenation of aromatic hydrocarbons. They can be accounted for, however, by cyclization of unsaturated hydrocarbon structures, for which a carbonium ion mechanism, in the presence of acid catalysts, has already been proposed, in certain cases, by Stevens and Spalding (*6*).

The instances in which cyclization of mono-olefins has been observed experimentally have been rare. Isobutene has been converted to 1.1.3-trimethyl cyclopentane in high yields by heating under pressure. However, many instances are known of the formation of cyclohexane or cyclohexene derivatives by the dimerization of dienes. As pointed out by Stevens and Spalding (*6, 7*), such cyclizations probably take place, by the action of acid catalysts, through a carbonium ion mechanism. They also showed that cyclopentanes can be formed in a similar manner, as in the case of 2.7-dimethyl octadiene-2.6:



They conclude that a cyclopentane ring can be formed by cyclization without difficulty when the acyclic diene is constituted so that formation of the cyclohexane ring is difficult because of steric factors, or because shift of the initial carbonium ion to positions favorable to cyclohexane formation involves too much energy. In view of the large number of instances in which C_6 rings are formed exclusively in such cyclizations, it seems reasonable to conclude that the cyclohexane ring is formed by preference. This suggests that the cyclopentanes in petroleum have been formed largely by isomerization of cyclohexanes. In this connection, however, it should be pointed out that the ratios of cyclohexane and methyl cyclopentane in gasolines vary widely and do not correspond to equilibrium proportions for any particular temperature.

TABLE 1

Crude source	Percentage by volume, in gasoline			
	Winkler, Texas	Conroe, Texas	Coalinga, California	Saxet, Texas
Methyl cyclopentane	1.63	2.97	10.29	5.52
Cyclohexane	0.64	4.34	7.63	15.07

The ratios of total cyclopentanes and cyclohexanes in the gasoline fractions of seven petroleums examined by the U. S. National Bureau of Standards showed variations between 8.4% cyclopentanes with 20.5% cyclohexanes (by vol), and 41.0% cyclopentanes with 27.5% cyclohexanes (Table 1).

The equilibrium between cyclohexane and methyl cyclohexane in the presence of aluminum chloride at 65° C shows 21.0% methyl cyclopentane.

These considerations have a most important bearing on the nature of the possible organic source material of petroleum and require that it be rich in olefinic material, and accordingly indicate that unsaturated fatty acids, such as are known to occur widely in marine organisms and algae, probably constitute the chief organic source of petroleum. High molecular weight polymers of the unsaturated fatty oils or acids may have been formed in the early stages, as suggested by Stadnikoff (*8*). The fatty acids and naphthenic acids found in petroleum, and usually considered together as "naphthenic acids," are probably vestigial remnants of the original fatty acids present in the original source material. Stevens (*7*) has suggested that chaulmoogric acid may be formed from linolic acid, or more probably from eleostearic acid, since in the latter the double bonds are so situated that cyclization may take place in a way analogous to the ring closing of citronellal to isopulegol. The cyclization of unsaturated fatty acids, or of olefinic material derived from them, by acid mineral catalysts affords a plausible explanation of the formation of the cycloparaffins that are so abundant in petroleums.

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Effect of Colchicine on Regeneration in *Pelmatohydra oligactis*

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The effect of colchicine on lower animals has been little studied. Hausman and Kolmer (*1*) found that higher temperatures increased the toxicity of colchicine for *Paramecium;* many other observers have reached the conclusion that colchicine is more toxic in warm-blooded than in cold-blooded animals. Barros (*2*) reported that colchicine stimulated growth in *Paramecium,* whereas others (*3, 4*) failed to obtain any detectable effects. Beams and Evans (*5*), however, reported a lowering of the viscosity or a prohibition of increased gelation, with a subsequent inhibition of cleavage, in *Arbacia* eggs.

The influence of colchicine on plants and higher animals has been well established (*6*), but its effects on protozoa and lower animals have not been well delineated; it was therefore decided to test the rate of regeneration of a lower animal in a colchicine medium. It was believed that the rates from young, rapidly dividing animal cells subject to the influence of colchicine might show the typical stathmokinesis (*c*-mitosis).

TABLE 1

Tentacles Regenerated at Each Observation (Each Series, 5 Hydras)

Series	A 1		A 2		A 3		C	
Hr	Total	Av	Total	Av	Total	Av	Total	Av
24	0	0.00	0	0.00	9	0.60	46	3.07
36	4.5	.30	18	1.20	30	2.00	52	3.47
48	9	.60	34	2.27	46	3.07	56	3.73
60	9	.60	42	2.80	50	3.33	57	3.80
72	12	0.80	41	2.73	50	3.33	56	3.73
84	21	1.40	41	2.73	50	3.33	56	3.73
96	13	0.87	41	2.73	50	3.33	56	3.73
108	13	.87	41	2.73	48	3.20	56	3.73
120	12	0.80	38	2.53	48	3.20	56	3.73

Pelmatohydra oligactis males of one clone, which had been well fed with cladocera, were sectioned just below the tentacles. After 30 min, 5 hydras were placed in each of 3 stender dishes containing 30 ml of the following concentrations of colchicine in pond water: A 1, 0.0033%; A 2, 0.000033%; A 3, 0.00000033%. For the controls, the same procedure was carried out with the animals in pond water (Series C). All the dishes were covered, placed in the dark, and examined every 12 hr for evidence of regeneration.

The pond water used had previously been filtered free of organic debris. Water analysis showed it to contain 0.050 g of organic matter and 0.171 g of inorganic matter per liter, carrying the following ions: Ca^{++}, Ba^{++}, Na^{+}, K^{+}, Mg^{++}, Fe^{+++}, Cl^{-}, $SO_4^{=}$, NO_3^{-}. *Vorticella, Halteria, Dileptus,* and dinoflagellates were abundant in the medium.

At the close of the experiment the specimens were examined cytologically by removing the regenerated sections, placing in 1 *N* HCl for 10 min, staining in acetocarmine for 2 min, and then squashing in the stain and mounting by ringing the cover slip with paraffin (salivary gland technique).

Hydra commonly regenerates 2 opposite tentacles immediately, followed shortly by the third. Then a fourth, fifth, or even more may arise by budding; nevertheless, 5 tentacles are characteristic for this species (*7*). The regeneration rate in a small sample is not uniform, and, as a result of individual variation in metabolic history and physiology, wide variations in numbers of tentacles at any one time level occasionally occur. This is particularly true in the case of an individual that is dying or entering a state of physiological depression. Not only are there wide variations from individual to individual, but also from trial to trial; these are due to the differences in the immediate physical and biotic environment and the

clonal metabolism. For these reasons, it was believed that the best indication of the relative rates of growth in any one concentration would be the mean number of tentacles present; these are graphed as the logarithm against the time in hours (Table 1).

The results, as illustrated by Fig. 1, indicate that

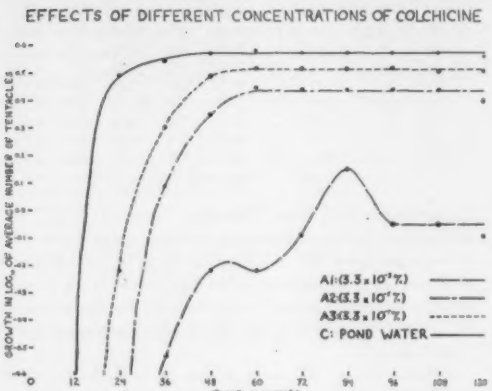

FIG. 1. Effects of different concentrations of colchicine.

the degree of inhibition of regeneration is a direct function of the concentration of colchicine. This agrees with the results of Bernhard on *Rana* (*8*), although he also obtained abnormal morphogenesis in regenerating tails.

The rates of regeneration as seen in Curves A 2 and A 3 appear to be depressed from the control (Curve C) by the toxicity of the alkaloid. Curve A 1, however, displays irregularities when compared to the other three. The distinct lag in absolute and relative growth rates seems to have been caused by stathmokinesis in conjunction with alkaloidal toxicity.

To test this hypothesis, cytological analyses were made. These examinations revealed, first, the fact that all the hydra (experimental, control, and nonexperimental from the same clone supply) showed polysomaty.[1] Second, an actual count was made comparing 2 regenerated sections (120-hr) from 0.0033% colchicine with the water controls, as to number of metaphases and anaphases. The following results per regenerated segment were obtained: control, 6 metaphases and 6 anaphases; colchicine-treated, 33 metaphases and 17 anaphases. In general, more mitotic figures were seen in the experimental animals, with a higher percentage of prophases being found in the control.

Therefore, the greater proportion of mitotic figures in the colchicine-treated specimen, as compared to the water control, indicated that the latter had completed the period of rapid growth in regeneration, whereas the former had not. The excess number of metaphases in the colchicine-treated specimen was visible proof of the effectiveness of the stathmokinetic properties of colchicine on animal cells. These results are in harmony with the observation of stathmokinesis in *Arbacia* eggs, mentioned above (*5*).

[1] Discovered by G. H. Mickey, of Northwestern University.

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The Use of a Precision Lathe in the Preparation of Biological Thin Sections

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Through the use of a small precision lathe of the type used by jewelers and instrument-makers it is possible to prepare sections of biological materials by a technique similar to that employed in the preparation of plywood.

The basic techniques and equipment for such a method are fairly simple. Biological materials to be sectioned are embedded in the usual manner in paraffin, and the trimmed block is mounted on the face of a suitable wire or wheel chuck. In order to affix the block to the chuck the latter is heated slightly, the block is pushed onto it, and both are cooled in water.

By means of an appropriate set of pulleys the speed of the lathe is reduced to approximately that of a rapidly operated microtome. The speed can be increased as the operator's technique improves. The cutting tool, which can be a simple razor blade mounted in a holder of the type used in removing paint from glass surfaces, is held firmly against the tool rest of the lathe at an angle corresponding to that used for the knife holder of a conventional rotary microtome. It is imperative that the cutting tool be held firmly against the tool rest and the block in order to prevent vibrations that would ruin the ribbon.

This technique affords a means of preparing conventional transverse and longitudinal sections in addition to "peeled" or veneer sections. If the long axis of a tissue specimen be mounted perpendicular to the axis of rotation it is possible to remove anterior and posterior transverse sections alternately. Longitudinal sections may be obtained by mounting the specimen eccentrically in the block, but with its long axis parallel to the axis of rotation. If longitudinal sections of the entire specimen are desired the material must be so placed as to be removed completely from the rotating center of the spindle.

It should be possible to peel completely a perfectly cylindrical specimen by this technique and, in the case of forms showing concentric growth patterns, to obtain a histological "spectrum" of the tissues composing

the "peeled" organism. In order to obtain such a preparation, however, it is necessary to mount the specimen so that its center exactly corresponds to the rotational axis of the lathe.

The technique is not restricted to use in the preparation of paraffin sections. Celloidin embedments mounted on wooden blocks in the conventional manner can readily be attached to screw-center chucks and sectioned longitudinally or transversely. By means of this procedure the routine sectioning of celloidin materials may be greatly accelerated.

The author has prepared only a limited number of materials by this method, but it seems to offer unique advantages to the biologist. It should be of particular value in the preparation of materials exhibiting concentric growth patterns or elongate cylindrical morphology. It has been employed to advantage, however, in the preparation of spherical sarcodinian protozoa for cytological study and should find ample development in other cytological investigations in which structural relationships of component tissues or cellular elements are not of prime importance.

The technique is capable of considerable refinement and must, indeed, be so refined if it is to become a routinely valuable one to the scientist.

Subcutaneous Implantation of Cortisone Pellets in Rheumatoid Arthritis

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Cortisone has been shown (*1–4*) to be useful as a palliative in rheumatoid arthritis when injected in aqueous suspension and when given orally. Wide experience with other steroids administered in the form of pellets implanted subcutaneously shows that excellent utilization is the rule. In the case of desoxycorticosterone acetate pellets used in the treatment of Addison's disease, constant absorption from the steroid depot created by pellet implantation exerts a physiologic effect that is sustained for many months. When comparable studies are made in the same patients it has been shown that the efficiency of 1 mg desoxycorticosterone acetate absorbed from pellets is about twice that of 1 mg absorbed from daily intramuscular injections (*5, 6*). Thorn and co-workers (*7*) found this to be true of cortisone pellets in patients with Addison's disease. From 3 to 10 pellets weighing 50–80 mg maintained the patients in good condition (under average demands) for 3 months, without observable biochemical disturbances.

It was deemed advisable to appraise the effect of cortisone pellets in patients with rheumatoid arthritis in the course of other studies we were carrying out with this drug (*8*). Eight adult patients with typical rheumatoid arthritis of severe grade received subcutaneous implantations of 900 mg cortisone as 12 pellets of 75 mg each. In four of the cases no cortisone in any form had been given previously. Four had been receiving cortisone by daily intramuscular injection for varying periods of time prior to the implantation and had also been receiving cortisone plus insulin.

Prompt clinical improvement of moderate degree followed the implantation and was sustained for 2–4 weeks, whereupon all the patients (except one) relapsed to their pretreatment condition. The exceptional patient was a man, H. C., aged 49, in Stage IV (*9*) of the disease, who had sustained a minor improvement with cortisone plus insulin, relapsed somewhat during 2 weeks without treatment and was then maintained in an improved state for 4 months after the implantation of pellets. In view of the long duration of "benefit," it appears probable that the disease had temporarily become quiescent from other causes.

Marked euphoria developed in one woman, C. W., who experienced her first epileptic seizure in 9 months one week after receiving the implantation. This patient enjoyed the most outstanding improvement, which continued for 3 weeks. The next best result consisted of moderate improvement in one woman, E. C., lasting 3 weeks. Four patients benefited slightly for one week after the implantation, and one woman, M. F., was not improved significantly.

It is of interest that the pharmacologic actions of cortisone by pellet implantation are of remarkably short duration in patients with intact adrenal cortices, in contrast to those with Addison's disease. Notwithstanding the low solubility of cortisone (as the acetate), the prolongation of action as with other steroids in pellet form is not achieved; the procedure more nearly resembles a short-term, intensive therapy.

It is our feeling that the patients were undertreated, even though most of them exhibited some manner of response. A new group is receiving twice the dosage discussed here; results will be reported later.

[1] The authors wish to express their sincere thanks to Christopher J. Reilly, attending surgeon, St. Barnabas Hospital, for his kind cooperation.

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Book Reviews

Josiah Willard Gibbs: The History of a Great Mind. Lynde Phelps Wheeler. New Haven, Conn.: Yale Univ. Press, 1951. 264 pp. $4.00.

It is not to be expected that the biography of a scientist like Willard Gibbs can convey very much to the general reader, except by indirection, concerning the man's work. More than the 200-odd pages of the present account would be needed to give the non-specialist any grasp of Gibbs' varied achievements in thermodynamics, statistical mechanics, vector analysis, and multiple algebra. Yet Gibbs has become a legendary figure not only to chemists, mathematicians, and physicists who encounter his work, but in some degree to the general public as well, which is learning to recognize him as probably America's outstanding scientific figure of the last century. Professor Wheeler's book is not another attempt, like the chapter of J. G. Crowther or the book of Muriel Rukeyser, to explain Gibbs by some sort of alchemy to persons without scientific background. But it will be a valuable companion volume to the serious works on Gibbs.

For a number of years the devoted students and disciples of Gibbs—men like Charles S. Hastings and E. B. Wilson—have been publishing here and there excellent reminiscences and biographical sketches of their teacher. The author of the present volume was also a pupil of Gibbs. A short time ago he presided over the publication of a small volume of Gibbs' early studies in applied mechanics. He has now made good use of the published biographical materials (of which he gives an extensive bibliography), as well as of valuable unpublished letters and manuscripts. With the aid of this material, he has written a clear and unpretentious book that is the only satisfactory study of the Yale scientist yet published, and that is worthy to take its place beside the Donnan and Haas *Commentary on the Scientific Writings of J. Willard Gibbs.*

The general reader will find portions of this book difficult, but there is something for him also. Wheeler gives a charming picture of the family and boyhood of Gibbs, of his early years at Yale, and of his rise to international eminence. It seems clear that Gibbs was genuinely appreciated in this country earlier than is commonly believed. Even the publication of his epoch-making trilogy of papers, "On the Equilibrium of Heterogeneous Substances," which no member of the Connecticut Academy could fully grasp or appreciate, testifies to the respect in which he was held by his colleagues before he had really demonstrated his powers. "We knew Gibbs and took contributions on faith," the president of the academy is quoted as saying. Clerk-Maxwell's prompt assistance in spreading the reputation and discoveries of Gibbs is documented by the letters of Gibbs' British correspondents. In America appreciation of Gibbs' achievement was early displayed by his election to the National Academy of Sciences and to the American Academy of Arts and Sciences and by an offer from President Gilman of a position on the faculty of Johns Hopkins.

One of the paradoxes of Gibbs' work has been the large number of fruitful applications of research that must have struck contemporary Americans as abstract and forbidding in the extreme. The climax of the Gibbs story—and I suppose, from some points of view, its fulfillment—is to be found in the vast literature that burgeoned in the decades following his death out of the few pregnant pages devoted to the phase rule. How fitting was this outcome is evident if we realize what Wheeler is the first to emphasize, namely, that Gibbs began his scientific career with interests that were mainly practical. His earliest ventures in science were concerned with improvements in the useful arts: the invention of a hydraulic turbine and of a railway car brake. His earliest paper, read before a meeting of the Connecticut Academy of Arts and Sciences early in 1866, dealt with the problem of units in mechanics. It is published as Appendix II in this excellent biography. Gibbs stood on the threshold of a new American appreciation of abstract science; his personal transition from practical invention to theoretical science of a most fundamental sort is a bench mark in the development of science in this country.

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The Polarographic Method of Analysis. 2nd ed. Otto H. Müller. Easton, Pa.: Chemical Education Pub., 1951. 209 pp. $3.50.

In keeping with its intended use as a college textbook, the first chapter presents a review of various types of electroanalytical methods. An excellent feature of the chapter is the analogy the author draws between potentiometric titration curves and polarographic waves. This reviewer is less enthusiastic about the discussion of electrode potentials on pages 10–12 in terms of "electron pressure," and the definition of indicator electrode on page 13 that excludes such common indicator electrodes as the silver electrode and the hydrogen electrode.

The emphasis on simple manual equipment in Chapter II on apparatus adds instructional utility to the text. This chapter also contains a discussion of many measurement details that should be useful to the student. Recording instruments are treated much too cursorily even for an elementary text. The biased remarks on page 52 present a very unfair picture of the capabilities of the most recent recording instruments.

Succeeding chapters discuss the factors governing the limiting current, the equations of waves of various types of reactions, and polarometry (amperometric titrations). These are followed by a chapter on spe-

cial techniques, including differential and derivative polarography, oscillographic polarography, and the use of electrodes other than the dropping electrode. The succeeding chapter considers some of the methods of standardizing the dropping electrode in practical analysis and indicates some practical applications. The final chapter, "Suggestions for Practical Polarography," is devoted chiefly to the characterization and selection of capillaries for the dropping electrode according to the "capillary constant" method developed by the author.

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Physiological Mechanisms in Animal Behaviour. Symposia of the Society for Experimental Biology, No. IV. New York: Academic Press, 1950. 482 pp. $6.00.

This symposium is an excellent survey of the theoretical views and recent findings of British and continental students of animal behavior. The primary aim of the symposium was to elucidate the physiological mechanisms that underlie behavior, but the conference was just as much a discussion of comparative psychology. In addition, considerable attention was given to problems of terminology, methodology, and the definition of theoretical aims.

American students of behavior should find this collection of papers refreshing reading, for it affords data on a much wider variety of species than have been studied in this country and presents a good summary of the much-overlooked European theories of behavior. Furthermore, the excellent bibliographies at the end of each contribution make the book a valuable reference work.

It is impossible to summarize the wealth of material the symposium presents. But a number of the more important ideas that came out of the conference can be listed briefly. In the section on the senses, it is pointed out that many invertebrates and lower vertebrates hear, see color, and communicate much more like mammals than has heretofore been suspected.

In the second section, it is shown that there may be far less stimulus control of behavior than prevalent theory assumes. In amphibia, once a stimulus elicits walking, central mechanisms can maintain the response pattern without any further stimulation. And in the case of polychaete worms it was shown that activity cycles are determined by central neural pacemakers in the absence of stimulation.

Many of Lorenz' and Tinbergen's concepts of innate behavior are discussed in the third section. Evidence is brought forward to support the view that specific internal states can lower the threshold of instinctive reactions even to the point where they go off "spontaneously." Typically, however, instinctive patterns are "released" by specific kinds of stimuli. The theory is that animals have evolved special organs and patterns of behavior that provide the releasing stimuli or, in the case of defense against predators, provide stimuli that inhibit the release of instincts.

In the final section on learning it is argued that the same types of learning occur among the lower forms as among the higher: habituation, classical conditioning, trial-and-error learning, insight learning, and imprinting. Imprinting is one-trial learning that can occur only very early in life—e.g., the newly hatched duckling learns to follow the first object it sees, human or inanimate, just as it normally follows its parent. Konorski summarizes in his contribution a theory of the mechanism of learning much like Pavlov's, but perhaps more inclusive. Finally, Lashley points out, on the basis of extensive evidence, that there is no ground for believing that specific memory traces are "stored" in particular neurons in any part of the nervous system. Rather, he believes, we must think of memory as a pattern of excitability imposed on large numbers of neurons by experience or training. Presumably the "memory" is elicited whenever all or some portion of these neurons is induced to produce the pattern. The crucial thing is that the pattern be elicited and not that particular neurons be aroused.

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Scientific Book Register

Fossil Mammals of Africa: The Pleistocene Fauna of Two Blue Nile Sites, No. 2. D. M. A. Bate, L. H. Wells, and A. D. Lacaille. London: British Museum (Natural History), 1951. 50 pp. 15s.

Methods in Medical Research, Vol. 4. Maurice B. Visscher, Ed. Chicago: Year Book Pub., 1951. 306 pp. $7.00.

Collected Papers of the Mayo Clinic and The Mayo Foundation, Vol. XLII. Richard M. Hewitt *et al.*, Eds. Philadelphia: Saunders, 1951. 812 pp. $11.50.

Analysis of the Four-Bar Linkage: Its Application to the Synthesis of Mechanisms. John A. Hrones and George L. Nelson. Cambridge, Mass.: Technology Press; New York: Wiley, 1951. 730 pp. $15.00.

Körpergrösse und Organzahl der Organismen. Hallische Monographien 18. F. A. Schilder. Halle (Saale), Germany: Max Niemeyer, Verlag, 1950. 58 pp. DM 6.80.

The Dinosaur Book: The Ruling Reptiles and Their Relatives. 2nd ed. Edwin H. Colbert; illus. by John C. Germann. New York–London: McGraw-Hill, 1951. Published for The American Museum of Natural History. 156 pp. $4.00.

Mathemstische Grundlagen der höheren Geodäsie und Kartographie: Das Erdsphäroid und seine konformen Abbildungen, Vol. I. E. König and K. H. Weise. West Berlin: Springer-Verlag, 1951. 522 pp. DM 46., cloth DM 49.60.

The Invertebrates: The Pseudocoelomate Bilateria: Acanthocephala, Aschelminthes, and Entoprocta, Vol. III. Libbie Henrietta Hyman. New York–London: McGraw-Hill, 1951. 572 pp. $9.00.

Quantum Mechanics of Particles and Wave Fields. Arthur March. New York: Wiley; London: Chapman & Hall, 1951. 292 pp. $5.50.

Association Affairs

Questions for the September Conference

Warren Weaver
The Rockefeller Foundation, New York

THE officers of the American Association for the Advancement of Science have received a letter, signed by A. J. Carlson, A. C. Ivy, and Ralph A. Rohweder, urging upon the AAAS a reexamination of its policy and its program of activities, so that they may more effectively fit into the present-day situation of science in the United States. The officers of the Association had themselves been considering the same general problem, and, stimulated by the letter referred to, they decided that a study should be made. It is the purpose here to give some background and to pose a few of the relevant questions, so that the membership of the AAAS can participate in the study.

The American Association for the Advancement of Science is now more than one hundred years old. During a large part of its first century its chief function was the holding of yearly meetings at which scientific papers were presented. Until comparatively recent years all major scientific groups were formally represented at these annual meetings. Then, as numbers grew large, one group after another—the chemists, the geologists, the physicists, the mathematicians, and now the biologists—considered it more effective to hold separate meetings for the presentation of technical papers and the transaction of society business.

As the character of the annual meetings of the AAAS began to change, the organization developed other activities. The most important was, and continues to be, a publication program. This program includes a weekly and a monthly journal, which the present administration is seeking to improve to the point where they will reflect not only the broad objectives of the Association, but also the spirit and progress of science with which these objectives must be identified. The publication program also involves the printing and distribution of volumes that report symposia arranged by the AAAS and, in certain cases, by other organizations. These are books of special interest which would be difficult to produce without AAAS help.

In addition to the two main functions of meetings and publication, the AAAS is engaged in a variety of other related activities. It has 223 affiliated and associated societies. With some of these it maintains close relations; with others the connections are somewhat more tenuous. In a variety of ways the AAAS has given service in situations that involve the interests of the various affiliated and associated groups. To aid the state academies of science, the AAAS has organized the academy conference, to consider, at the state level, programs and objectives similar to those that concern the AAAS at the national level. In 1946 the Association was asked to assume leadership in the formation of an Inter-Society Committee in support of a National Science Foundation. The AAAS also has nominal leadership in the work of the Cooperative Committee on the Teaching of Science and Mathematics.

The AAAS also sponsors the Gordon Research Conferences, which provide specialists in many chemical fields with an opportunity to advance basic and applied research through unrestricted discussion.

The Association encourages research by means of small grants, particularly those administered by the state academies of science, and through awards such as the Thousand Dollar Prize, the Theobald Smith Award, and the AAAS–George Westinghouse Science Writing Award.

The Association has working contacts with a rather wide variety of other organizations such as Unesco, the American Standards Association, and the American Council on Education, through direct representation or through membership on committees. In addition, the officers perform numerous service functions of different types for scientific groups, government agencies, individual scientists, and private institutions.

This brief description of the main activities of the AAAS has been given here as a factual background for a series of questions that the officers think deserve careful study. The central and main question is: In view of the present organization and the needs of science, in what ways can the AAAS best serve the over-all interests of science in the United States and elsewhere?

Is the system of large annual meetings antiquated? What kind, or kinds, of meetings can and should the AAAS hold? Can this great organization act as a synthesizing influence in science? Is this one of its great opportunities? Should the AAAS, as the voice of science, recognize as one of its principal activities (perhaps *the* principal one) the exposition and interpretation of science not only to all scientists, but, even more important, to the general public? If so, how can this be done? What is the most effective relationship between the AAAS, on the one hand, and, on the other, the affiliated and associated societies, individual scientists, the National Research Council, the National Science Foundation, the public at large, and government? How can the AAAS journals be improved? Are there new kinds of activities that the AAAS should undertake?

In September a meeting will be held near New York City that will be attended by the members of the Executive Committee of the AAAS and by approximately ten other men invited as consultants. This meeting will be devoted to a preliminary discussion of the sort of questions just raised. Members of the AAAS who have ideas and suggestions are urged to submit them *before September 12* to Dr. Warren Weaver, Room 5500, 49 W. 49th St., New York City 20.

News and Notes

Scientists in the News

Lawrence W. Bass, vice president of U. S. Industrial Chemicals, Inc., New York City, has been named chairman of the Committee on Equipment and Materials of the Research and Development Board, Department of Defense. Dr. Bass succeeds **E. Pennell Brooks,** who has become head of the newly organized Sloan School of Industrial Management at MIT.

Carroll L. Birch, professor of medicine at the University of Illinois, has been appointed dean of the Lady Hardinge Medical College for Women at New Delhi, India. She will remain in New Delhi for a year. Lady Hardinge Medical College is the only Indian medical institution for the training of women.

United Cerebral Palsy has appointed **Mrs. J. Howard Brinckerhoff** associate director to assume charge of field activities throughout the United States, Canada, and South Africa. Mrs. Brinckerhoff, who joined United Cerebral Palsy in 1949, has served as regional director covering the Northern, Eastern, and Central states and Canada.

H. Boris Burns has been elected president of the Arlington Chemical Company, Inc., which was recently acquired by the U. S. Vitamin Corporation. Mr. Burns became executive vice president of U. S. Vitamin in 1936 and will continue as president, to which office he was elected in 1940.

Richard J. Cross, of Fair Lawn, N. J., has been named by Columbia University as the first recipient of the Walter W. Palmer Fellowship for the 1951–52 academic year. Dr. Cross is doing biochemical research at the Public Health Research Institute. The fellowship was established in 1949 by the Martha Washington Straus–Harry H. Straus Foundation, Inc.

Clarence Dennis has been appointed professor of surgery and director of general surgery, University Division, at Kings County Hospital, a branch of the College of Medicine, State University of New York at New York City. He is professor of surgery at the University of Minnesota School of Medical Sciences.

B. T. Dickson, chief of the Division of Plant Industry, has retired after 23 years with Australia's Commonwealth Scientific and Industrial Research Organization. Dr. Dickson arrived in Australia from Canada in 1927 to form the division. Under his leadership it has grown into a major research institute, with headquarters at Canberra and with branch laboratories and field stations at many points throughout Australia. Prior to joining the staff of CSIRO Dr. Dickson was professor of plant pathology and economic botany at McGill. He has been succeeded by **O. H. Frankel,** director of the Crop Research Division of the New Zealand Department of Scientific and Industrial Research.

Harry Julius Emeléus, professor of inorganic chemistry and fellow of Sidney Sussex College at the University of Cambridge, Eng., lectured this month on "Recent Advances in the Chemistry of the Interhalogen Compounds" at Illinois Institute of Technology.

Richard T. Evans and **Frederick M. Hart,** who retired on July 31 from the Geological Survey after 52 and 51 years' service, respectively, were presented with illuminated scrolls, awards for meritorious service, and other tokens on behalf of the Survey. Mr. Evans has served in the Survey's Topographic Division since 1899. Mr. Hart entered the federal service in 1900, and since 1908 he has worked in the Section of Cartography, now called the Special Map Projects Section.

Stanley Frankel, assistant professor of applied mechanics in charge of the Digital Computing Group at Caltech, is at the University, Manchester, Eng., as a guest of the British government for work on a problem in mathematical neurophysiology.

Irving Glickman has been appointed director of the Graduate and Postgraduate Studies Division at Tufts College Dental School. Dr. Glickman is professor of oral pathology and periodontology and succeeds **Arthur H. Wuehrmann,** who resigned to join the new dental school at the University of Alabama.

David Green has been made head of the newly formed Animal Nutrition Department in the Research Division of Armour and Company. Dr. Green is a specialist in the application of the B vitamins in animal nutrition and in antibiotic feed supplements.

Directors of Canada Southern Oils, Ltd., formed to take over the Canadian and Ecuadorian interests of Pancoastal Oil Company, C. A., have announced the election of **Cecil V. Hagen** as president. Mr. Hagen formerly was chief geologist in charge of exploration for the Superior Oil Company of California. He now operates his own geological consulting concern.

Wilson F. Harwood has assumed his duties as assistant director for administration of the National Science Foundation. He has been executive assistant to the director of the National Bureau of Standards since early this year and has been on loan from the bureau to assist, on a part-time basis, in the staffing and organization of the foundation.

Bartholomew W. Hogan, former commanding officer of the Naval Medical School at Bethesda, Md., has taken charge of the Naval Medical Hospital, succeeding **Robert M. Gillett,** who has been assigned to sea duty.

Elizabeth Hyde has resigned as professor of chemistry at Wells College, Aurora, N. Y., to become professor of chemistry at Wesleyan College, Macon, Ga.

F. J. Kearns has been appointed senior research officer of Australia's Commonwealth Fisheries Office, for research into economic problems affecting the fishing industry. Mr. Kearns has been officer-in-charge of the Sydney Higher Appointments Office of the Commonwealth Employment Service and a member of the planning and research staff.

The second of the National Science Foundation's technical divisions has been established with the appointment of **Harry C. Kelly** as assistant director for the Division of Scientific Personnel and Education. The Division of Biological Sciences was the first of the four statutory divisions to be established. The new division will be responsible for the development and administration of programs related to the granting of scholarships and fellowships; and, as an initial undertaking, the division will also explore what may be done along the lines of coordination of teaching and research. Dr. Kelly has been head of the Scientific Section of the Office of Naval Research Branch Office in Chicago.

The Academic Senate of the University of Edinburgh, at the recommendation of the Faculty of Medicine of that university, has awarded the 1951 Cameron Prize in Practical Therapeutics jointly to **Edward C. Kendall**, of Mayo, and to **Tadeus Reichstein**, of the University of Basel, Switzerland, for "their fundamental researches leading to the discovery of cortisone."

James J. Kerrigan, president, and **James M. Carlisle**, medical director, of Merck & Co., Inc., were among those awarded honorary degrees of Doctor of Laws in Dublin by the National University of Ireland.

J. A. A. Ketelaar, director of the General and Inorganic Chemical Institute of the University of Amsterdam, Holland, will be at Brown University during the next academic year as a visiting professor.

Ernest Lawrence and **Donald Cooksey**, of the University of California, recently arrived in Stockholm to study the Swedish cyclotrons. A new unit of 25 mev has just been completed at the Swedish Government Research Institute for Physics, of which Manne Siegbahn is head. The institute already possessed a smaller cyclotron, and a third unit is being constructed under the supervision of The Svedberg, professor of physical chemistry at the University of Upsala.

Clyde B. Morgan has been elected president and a director of Rayonier, Inc. Since 1941 he has been president of the Eastern Corporation. The presidency of Rayonier had been vacant since the resignation of **Edward Bartsch** last November.

D. S. Muzzey has been made chief of the Magnetics Division of the Engineering Department at the Naval Ordnance Laboratory, succeeding **E. A. Gaugler**, resigned. Dr. Muzzey has been deputy chief of the Underwater Ordnance Department.

Howard K. Nason, has been appointed director of research of the Organic Chemicals Division of Monsanto Chemical Company, succeeding **Richard M. Hitchens**, who has been director since 1947.

Ira G. Needles, vice president of the B. F. Goodrich Rubber Company of Canada, Ltd., since 1945, has been elected its president. Mr. Needles succeeds **George W. Sawin**, who resigned for reasons of health. Mr. Needles joined the parent company in 1916 and Goodrich of Canada in 1925.

Charles Lane Newberry has been named special assistant to the chief of the Division of Industrial Hygiene, USPHS. He will be responsible for the development of rehabilitative and health services in industry. Dr. Newberry has had experience with physical restoration programs in the Office of Vocational Rehabilitation for the past five years.

Mildred E. Newton, assistant dean of the University of California School of Nursing, has been made head of Ohio State University's School of Nursing. Miss Newton, who will succeed **Frances McKenna**, will hold the rank of professor of nursing education and director of the school. The new director has been at the University of California since August 1934, and in her present rank of assistant dean since July 1944. Previously she served at Pasadena Hospital and Junior College as instructor and later as director of the School of Nursing.

R. R. Overman, associate professor of physiology at the University of Tennessee Medical Units, has been named director of a new laboratory of clinical physiology. Establishment of the laboratory is part of the current expansion program of the university's College of Medicine. It will permit more research at John Gaston Hospital, teaching hospital of the college.

Kremers-Urban Company has announced the appointment of **Horace H. Palmer** as bacteriologist. He will serve at the main Kremers-Urban plant in Milwaukee. He was previously associated with Oscar Mayer & Company, Chicago, as chief chemist and bacteriologist.

New York Medical College, Flower–Fifth Avenue Hospital has named **Sophie Rabinoff** as professor and director of the Department of Public Health and Industrial Medicine. Dr. Rabinoff formerly was connected with the City Health Department.

Louis L. Ray, in charge of the Alaska Terrain and Permafrost Section of the U. S. Geological Survey, attended the 25th anniversary meetings of the *Archiv für Polarforschung*, held at Kiel, Germany.

Abraham White, vice president and director of research, Chemical Specialties Co., Inc., New York, has been appointed lecturer in biochemistry, College of Physicians & Surgeons, Columbia University.

Education

Duke University will inaugurate a training center for premature infant care this fall. Public health and graduate nurses throughout the state will be trained at the Duke School of Nursing, under the direction of Eileen Kiernan, formerly of New York Hospital.

The **Illinois Neuropsychiatric Institute**, Chicago, formerly operated jointly by the State Department of Public Welfare and the University of Illinois, has been transferred to the University of Illinois. Eric Oldberg will serve as director of the Division of Neurology and Neurological Surgery, and Francis J. Gerty as director of the Division of Psychiatry. The State Psychopathic Institute and the Pathological Laboratory, housed in the institute building, will remain under state jurisdiction.

The construction program of the **Instituto Tropical de Investigaciones Científicas de la Universidad Autónoma** of El Salvador, the new institute founded last year, is nearing completion. The research staff, other than the technical director and two assistants, is to consist entirely of guest scientists from abroad. The institute can accommodate about ten such visitors, who will be the guests of El Salvador.

The **Inter-American Institute of Agricultural Sciences**, under a grant from the Shell Oil Company of Delaware, is investigating the reaction of tropical plants to new insecticides, fungicides, and herbicides. Kenneth L. Olsen is in charge of the project, with Oliver Newton as a collaborator. The institute is also the center of an abacá program, in cooperation with the USDA, which will give emphasis to basic research related to the expansion of cultivation of this important industrial fiber plant. B. B. Robinson, of the Division of Cotton and Other Plant Fibers, will be in charge, and Charles H. Batchelder, entomologist, and William Q. Loegering, plant pathologist, will conduct research in their respective fields. A soils technician will also be supplied.

The **New York Zoological Society's** Department of Tropical Research has returned from its 49th expedition. Five months were spent at the new field station at Simla in north-central Trinidad. Work was concentrated on a preliminary survey of the ecology of Arima Valley, with special reference to birds, a study of the aggressive and defensive behavior of mantids, and the breeding of butterflies in large open-air cages in order to study their social behavior under partially controlled conditions. William Beebe directed the expedition; other members were Jocelyn Crane, Henry Fleming, John Cody, and Ellen Ordway.

A series of lectures on modern chemistry, around the theme "New Analytical Tools for Research," will be sponsored by **Northwestern University** on Tuesday evenings extending from Oct. 2 through Dec. 11. Further information may be obtained from Donald D. DeFord, Department of Chemistry, Northwestern University, Evanston, Ill.

Grants and Fellowships

The **Children's Bureau** is making $100,000 available annually to pay the cost of care at regional heart centers that will provide surgical and hospital care for "blue babies." The first such center is already in operation at the Grace–New Haven Community Hospital in Connecticut. About 100 children per year, referred by doctors, parents, or other individuals or groups, can be cared for.

With a fund of $25,000 bequeathed it by Newcomb Cleveland, anonymous donor of its annual Thousand Dollar Prize, for "a notable contribution to science," the AAAS will continue to make the award under the name of **The Newcomb Cleveland Prize.**

The **Ford Foundation** will support, by an initial allocation of $5,000,000, a program of overseas projects for the "development and better use of economic resources," beginning with India and Pakistan. Paul G. Hoffman, John Cowles, Chester C. Davis, John B. Howard, and Paul B. Helms recently toured Europe and Asia in search of projects that "cannot be financed by local governments or by our government, but that will promote understanding and reduce tensions" among nations.

Rockefeller Foundation grants for the second quarter of 1951 totaled $4,771,788. The International Press Institute, organized in Paris last May, will receive $120,000 for operating expenses over a three-year period, with an additional sum of $150,000 being given by the **Ford Foundation** for the same purpose. The institute's immediate objectives are the safeguarding of freedom of the press and the achievement of understanding among peoples. One of the largest grants went to Indiana University, which will receive $200,000 for research in genetics under H. J. Muller, Tracy M. Sonneborn, and Ralph E. Cleland. More than half a million dollars will support projects in medicine and public health in the U. S. and foreign countries; $1,193,250 went to the social sciences, $112,430 to the humanities, and another half a million to the natural sciences.

Swift & Company has approved grants-in-aid totaling $140,000 for the support of long- and short-term scientific studies in agriculture and human nutrition. Twenty-two universities and other research institutions in the U. S. and Canada will share in the 29 grants. Among the agricultural studies, which may cover a five-year period, are the Southern Great Plains Feeding Project, and support of the journal *Biological Abstracts*. Institutions receiving aid for studies in human nutrition, which will extend over one year and are renewable, include the University of Florida, for an investigation of the relation of newly discovered vitamins to growth; Washington University, for a study of protein requirements in old age; and the University of Rochester, where Lloyd J. Filer, Jr., of the School of Medicine and Dentistry, will study the role of iron in the metabolism of infants. The recent awards bring this year's total to $160,000.

Meetings and Elections

The **American Foundation for the Blind** has elected the following new trustees: Deane W. Malott, J. P. Morgan 2nd, F. E. Davis, and Roy Kumpe. M. C. Migel, chairman of the board, William Ziegler, Jr., president, and other foundation officers were re-elected.

At the annual meeting in Cleveland of the **American Home Economics Association** Elizabeth S. Herbert was elected president. Vice presidents elected were Catherine Dennis, Olga Brucher, and Beulah Gillaspie. Jessie McQueen was elected recording secretary, and U. Vivian Crow treasurer. Patricia Doyle, of the University of Omaha, assumed office as president of the undergraduate group affiliated with the association.

A **Canadian Psychiatric Association** was organized at a meeting in Montreal last June. Officers elected for 1951–52 are: president, Robert O. Jones; vice president, Charles G. Stogdill; secretary, John P. S. Cathcart; and treasurer, R. C. M. Hamilton. Each province is represented by a director.

The second **Conference on Coastal Engineering** will to be held at the Rice Hotel, Houston, Texas, Nov. 7–10 for the purpose of summarizing current information and techniques for engineers engaged in the design, construction, operation, and maintenance of coastal works. Southwest Research Institute is sponsoring the conference, with the cooperation of the University of California, Texas A & M Research Foundation, The Rice Institute, the University of Houston, and the Houston branch of the ASCE. Information and programs may be obtained from Charles E. Balleisen, Southwest Research Institute, 8500 Culebra Rd., San Antonio 6.

The annual meeting of the **Electron Microscope Society of America** will be held in Franklin Hall of the Franklin Institute, Philadelphia, Nov. 8–10. Besides contributed papers and a display of electron micrographs and commercial exhibits, there will be a symposium on "Elementary Electron Optics and Factors Affecting the Electron Microscopical Image." Programs and abstracts will be available from T. G. Rochow, American Cyanamid Company, Stamford, Conn.

The annual meeting of the **International Council of Women Psychologists** in Chicago this month will feature a panel on "Children Around the World." Helen L. Koch will be moderator, and Doris T. Allen, Hildegard Durfee, David Kopel, Elizabeth Morris, and Marjorie Page Schauffler will participate in the discussion.

Charles L. Brown, dean of Hahnemann Medical College, and Charles E. Kossmann, of New York University Medical School, have been appointed as chief consultant in internal medicine and in cardiology, respectively, on the Board of Central Office Consultants of the **Veterans Administration.**

The first international conclave of its kind, the **World Metallurgical Congress,** to be held in Detroit, Oct. 14–19, as part of the 250th anniversary of the Michigan city, expects approximately 400 foreign "conferees" to arrive in the U. S. about Sept. 15. The American Society for Metals, sponsor of the congress and the National Metals Exposition and Congress, is arranging study tours of American industry for the foreign visitors both before and after the congress, in cooperation with ECA and OEECC, in which some 150 plants in 13 states and 57 cities will be visited. Zay Jeffries, former vice president of General Electric, and a past president of the American Society for Metals, has been appointed director general of the congress. For information concerning the meeting, write to Wm. H. Eisenman, 7301 Euclid Ave., Cleveland, Ohio.

Miscellaneous

The **Hacker Foundation for Psychiatric Research and Education** has moved to new and larger quarters at 160 Lasky Drive, Beverly Hills, Calif. In its new quarters the foundation will initiate a research program and offer seminars and lecture courses on psychiatry and allied subjects to interested community groups. Esther Murray, executive director of the foundation, will supply further information.

Elsevier Press has moved its main office from New York to 402 Lovett Blvd., Houston 6, Texas, although a branch will remain at 445 Park Ave., New York 22. **Commonwealth Fund of New York** books in the future will be issued through Harvard University Press, which will handle manufacturing, sales, promotion, and distribution. A new joint publishing venture, the **University of Kansas City Press–Twayne Publishers,** has been organized as a medium for belles-lettres and works of scholarly interest. **Pacific Book and Supply Corporation,** which will export books, periodicals, and office and school supplies to Indonesia, has opened a New York office at 667 Madison Ave. Five tons of books have already been shipped to the Pacific area office. The **University of Texas Press** will publish a reprint of Ashbel Smith's account of the yellow fever epidemic in Galveston in 1839, which will include a biographical sketch of Smith and a general account of the development of knowledge regarding the control of yellow fever. Ashbel Smith (1805–86) was a founder of the University of Texas and the first chairman of its Board of Regents.

Science writers are invited to write or wire to Westinghouse Awards, 1515 Massachusetts Ave., N.W., Washington 5, D. C., for details of the annual $1,000 **AAAS-George Westinghouse Science Writing Awards** for both newspaper and magazine writers. Nominations for the awards are also invited. Deadline for receipt of entries, which must be made in triplicate, is *Oct. 8.*

Two grants have been made by the **Damon Runyon Memorial Fund for Cancer Research** to the University of Texas Medical Branch, Galveston, one to the Pharmacology Laboratory for work under the direction of George A. Emerson, and one to the Tissue Culture Laboratory for work under the direction of Charles M. Pomerat.

The National Science Foundation Program[1]

The **National Science Foundation** program, for its first year of operations, is based on the modest budget of $14,000,000 which the President recommended. Although scientists generally will agree that this amount would fall far short of meeting the total national need for increased support of basic research and education in the natural sciences, it nevertheless affords the opportunity for a sound approach to the problem. That such an approach should be made is all the more important in a time of national emergency.

On the basis of a preliminary survey of the need, the foundation planned to allocate $8,155,000 for the support of basic research in the medical, biological, mathematical, physical, and engineering sciences, and $5,060,000 for the training of scientific personnel through the award of graduate and postgraduate fellowships.

The smallest portion of the budget, $785,000, has been earmarked for the development of national research policy and for operating expenses. The $50,000 specifically set aside for policy development in no sense reflects the degree of importance that attaches to this function. But the National Science Board and the foundation staff as well feel that a comprehensive policy can only be realized as a result of the meeting of many minds, including those of both scientists and laymen. The foundation will wish to draw upon the experience and the counsel of individuals and of groups representative of a broad cross section of American science and education, but it is not contemplated that this process will involve a large expenditure of funds. Every effort has been made to reserve as much as possible of the 14 million total for substantive operations.

Funds for the support of research were planned for allocation as follows: $3,913,000 for the mathematical, physical, and engineering sciences; $2,600,000 for the biological sciences; and $1,300,000 for the medical sciences. This breakdown follows the organizational pattern of the technical divisions prescribed by the Act. Consideration of specific proposals in these areas has been made contingent upon action by Congress in appropriating funds. The foundation must also complete the staffing of the technical divisions before it will be in a position to evaluate research proposals in all areas against the necessary background of information on the current status of research in a given field.

Those loyal friends of the foundation who have faithfully followed its fortunes through the uncertain years of its inception and who therefore are the ones most interested in seeing it get under way will nevertheless be the first to recognize that worth-while research programs do not spring fully planned from the head of any one man. Support that is to be meaningful must be given to investigators for work in promising areas, and such judgments should not be rendered hastily or without opportunity for review of the entire field.

A steady stream of basic research proposals has been flowing in all summer. There has been general progress throughout all the subject areas in the formulation of a support program, but the program in biological sciences is furthest along. John Field, assistant director for the biological sciences, who is on leave of absence as chairman of the Department of Physiology of the University of California at Los Angeles, was the first of the division heads to join the staff.

In the other major area of pragrammatic operations—fellowships and scholarships—there are fortunately fewer problems to be met in getting under way. Under the guidance of Harry Kelly, assistant director for scientific personnel and education, the foundation hopes to launch a pilot program of research fellowships in the natural sciences at the beginning of the winter term in 1952, on the basis of approximately 10 per cent of the funds authorized by Congress for the 1952 fiscal year fellowship program.

The decision to give immediate attention to the fellowship program is based on the obvious impending shortages of trained scientific manpower. Not only is there complete agreement among government agencies, scientific and technical societies, and other interested groups that severe shortages exist in varying degrees in every field requiring scientific specialized training, but these are expected to become more acute.

Although the foundation is authorized in its legislation to award both scholarships and fellowships, the decision to begin with the fellowship program was made because additional training at the graduate and postdoctoral levels would have the most immediate effects upon the scientific manpower supply. In order to make it possible to award some fellowships as early as January 1952, the foundation planned to contract with the National Academy of Sciences to utilize the experience and facilities of the National Research Council in publicizing the program, receiving applications and testing and screening the candidates for the final selection by the National Science Foundation. Criteria for the selection of the candidates will be established by the foundation, which will present the names of the proposed fellows to the National Science Board for final review and approval. Ability will be the primary basis for selection.

Dr. Kelly and his staff also have interesting plans

[1] As this issue of SCIENCE goes to press, the program discussed by Dr. Waterman appears more remote than he knew. The House Appropriations Committee has cut the NSF budget from $14,000,000 to $300,000. Whether the cut will be restored in the Senate, or will survive conference if it is restored, is problematical.—Editors.

looking to ways and means of according recognition to teachers of science for their accomplishments and of providing opportunities for them to keep up to date with findings in research.

Other items for which the foundation contemplates support in 1952 fall generally in the area of research administration. Research and development planning has been hampered to a very considerable extent by the lack of complete, current, and reliable statistics regarding the scientific population. Under the terms of the *National Science Foundation Act*, the foundation is directed "to maintain a register of scientific and technical personnel and in other ways provide a central clearinghouse for information covering all scientific and technical personnel in the United States, including its territories and possessions." Toward this end the foundation budgeted $156,000 for the maintenance of the National Scientific Register during 1952. The register, which for the past year has been operating under the U. S. Office of Education, is proving extremely useful for scientific manpower studies needed for the defense mobilization program.

Another item under the general category of research policy development and services, the dissemination of scientific information, is one that I believe will command the widespread interest of scientists. Here is a problem common to all scientists and to all disciplines, which has only recently begun to take on the character of an independent entity worthy of research in its own right. One of the earliest explicit definitions of the problem was set forth by Vannevar Bush in his article entitled "As We May Think":

> The difficulty seems to be, not so much that we publish unduly in view of the extent and variety of present day interests, but rather that publication has been extended far beyond our present ability to make real use of the record. The summation of human experience is being expanded at a prodigious rate, and the means we use for threading through the consequent maze to the momentarily important item is the same as was used in the days of square-rigged ships (*Atlantic Monthly*, 176, [1], [July 1945]).

The frustration of the scientist who tries to keep even reasonably abreast of current developments in his field is measurable to some extent by the volume of publication. The Science Division of the Library of Congress estimates that the library receives 40,000 different scientific and technical periodicals a year. Based on a representative sampling of the 40,000, the division estimates a total number of about 272,000 issues. There are approximately 10.7 articles per issue, so that a total of something like 2,900,000 scientific and technical articles is received in a year. These, of course, are in every language, so that in addition to problems of indexing and abstracting, there are also problems of translation. Nor do these figures necessarily suggest the total extent of existing material even in the field of periodicals. The library estimates that Poland alone, for example, publishes 106 scientific and technical journals, of which the library receives only a small fraction. Nor does this mention of the literature problem make any reference to books or to the now really formidable volume of technical reports, many of which are never formally published, or are given small circulation by government agencies, and therefore are unknown to cataloguers, bibliographers, and indexers.

Dr. Bush suggests that the time has come for science to apply the highly developed tools of the present day to its own problems. Funds allocated by the National Science Foundation for scientific information contemplate a thorough examination of the problem and the exploration of new methods for coping with the volume.

The foundation has active interest, also, in another major medium for the exchange of information: international congresses and meetings. Recognizing the importance to American science of representation at significant international gatherings, the foundation budgeted $60,000 for the purpose of enabling some 60–80 scientists to attend such meetings.

Another important activity which now looks to the National Science Foundation for support is the Interdepartmental Committee on Research and Development. This committee, which has operated as a coordinating body for the scientific agencies of the government, is part of the over-all pattern for the administration of research in the federal government contemplated by the President's Scientific Research Board in its *Report to the President*. The foundation budget included $26,000 to cover the salaries of the committee secretariat in 1952.

The terms of reference envisaged for the National Science Foundation by the authors and supporters of its legislation are broad and far-seeing. The conditions covering both the support of research and the award of fellowships and scholarships were drawn with full appreciation of the impossibility of charting, except in very general terms, the pursuit of the unknown and the schooling of the creative mind. Those who were apprehensive lest government support of research should bring with it the threat of thought-control or excessive burdens of administrative accountability have noted with gratification that the *National Science Foundation Act* recognizes the global scope of science, the unpredictability of basic research, and the desirability of permitting the scholarly investigator to pursue the natural inclinations of his interest without the necessity of economic sacrifice.

It is to be hoped that the National Science Foundation will have the opportunity to make full use of this effective legislative implement for the continuing replenishment of the store of scientific knowledge. There is universal acknowledgment that the maintenance of scientific supremacy is essential for national survival, but what must also be recognized is that more than ever in times of emergency the sources of scientific progress must be strengthened and nourished. The National Science Foundation can and should make an important contribution to this vital aspect of national defense.

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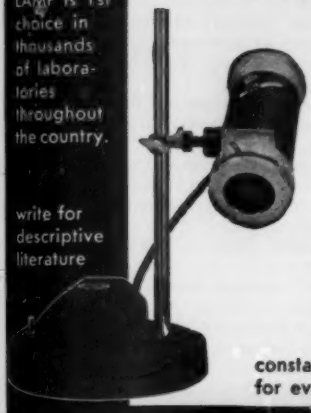

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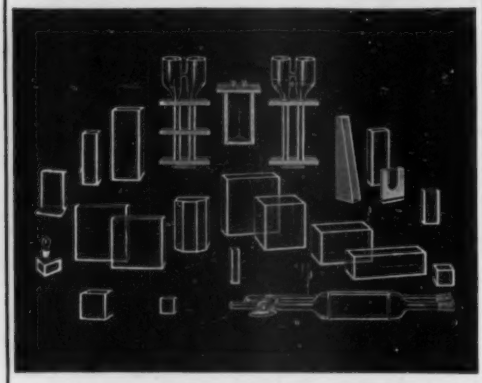

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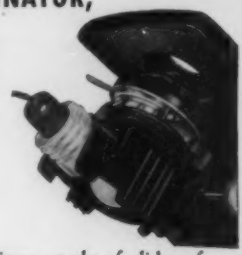

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